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Division of Myriapoda & Arachnida
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BRANDTIA

A SERIES OF OCCASIONAL PAPERS

ON

DIPLOPODA

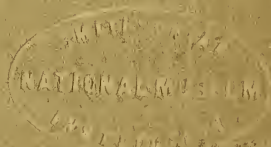
AND

OTHER ARTHROPODA

BY

O. F. COOK.

HUNTINGTON, NEW YORK,
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I.

A SYNOPSIS OF MALAYAN PLATYRRHACIDÆ.

A recent opportunity of examining for the second time some of the types of species of this group in the Berlin Museum has confirmed the opinion that several genera have hitherto been confused under the names *Stenonia*, *Platyrrhacus*, and *Acanthodesmus*. As a beginning toward the elucidation of the group the following synopsis of generic types studied by me is here offered. Drawings and extended descriptions are in preparation.

Very large (90-130 mm. in length); dorsum very slightly granular, coriaceous, or smooth, except that there are three more or less distinct transverse rows of small tubercles; lateral margin of carinæ with several coarse teeth; first segment broadest in front, the anterior corners produced and rounded: Genus *Phyodesmus*, type *Ph. pictus* (Peters), Borneo.

Small to large (not exceeding 90 mm.); dorsum densely granular, or the lateral carinæ with margins subentire, erose, or deeply bifid; first segment subelliptic, broadest at or behind the middle, the anterior corners not developed.

Sterna with two pairs of long, sharp spines, of which the anterior pair is directed cephalad, the posterior caudad; carinæ laterally margined outside the pore: Genus *Phractodesmus*, type *Phr. subvittatus* (Peters), Linga.

Sterna unarmed, or with four more or less distinct, short, conic spines all directed ventrad or slightly caudad; carinæ laterally immarginate, or the pore included in the margin.

Copulatory legs unbranched, extended into a long, coiled process: Genus *Derodesmus*, type *D. flagellifer*, *sp. n.*, Ternate.

Copulatory legs with two or three distinct prongs.

Dorsum with three conspicuous and equal transverse rows of prominent, oval, smooth, tubercles; carinæ laterally strongly margined; margin smooth and prominent, below with a large rounded tooth; pores borne in lateral excavations of the thickened margins, except on posterior segments where they are subdorsal: Genus *Taphodesmus*, type *T. moluccensis* (Peters).

Dorsum with the posterior row of tubercles much more prominent than the usually inconspicuous anterior rows; lateral margins of carinæ not thickened nor smooth.

Copulatory legs with the horny, transparent and smooth ungual portion of the last joint about twice as long as the oval basal hairy part; basal parts of the two legs *in situ* approximate; distal portions curved mesad at base and crossing each other, after which a broad, short, flat incurved lamina is given off the dorsal (anterior) side, while the long slender ramus is again bent mesad and recurved upon its fellow, so that a large oval space appears to be entirely enclosed between the terminal rami of the two legs when viewed *in situ* from below: Genus *Ilodesmus*, type *I. meyenii* (Brandt), Manila.

Copulatory legs with the ungual rami not longer than the hairy basal portion, and not crossing each other before branching; also not recurved

upon each other so as to enclose a median space; the shorter anterior (dorsal) ramus is moreover not conspicuously flattened or expanded.

Copulatory legs with basal hairy portion of the last joint very narrow and slender, nowhere broader than the ungual portion at the base of the first (lateral) division, which is long, slender, at first nearly straight, and almost perpendicular to the basal part of the joint; the mesial ramus is at first flat and rather broad, crosses its fellow, and near the apex is again divided, the three branches being short, subequal and divaricate: Genus *Psaphodesmus*, type *Ps. concolor* (Peters), Moti.

Copulatory legs with hairy basal portion of last joint conspicuously thicker and broader than distal horny part.

Body rather slender, and with the carinæ rather remote; dorsum scarcely convex, nearly smooth, or indistinctly granular laterad; carinæ with lateral margins entire or faintly sinuate; corners rounded, the posterior produced only on posterior segments; pores removed from the margin by more than the width of the poriferous ring: Genus *Leurodesmus*, type *L. sumatranus* (Peters).

Body robust and with the carinæ adjacent, or the dorsum distinctly convex and distinctly granular; carinæ with lateral margins dentate, incised, or the posterior corner distinctly angled or produced on middle segments; pores variously located.

Last segment subtriangular, the apex distinctly narrowed and produced; two prominent setiferous tubercles near the longitudinal middle of the dorsal surface of the segment; carinæ with anterior margin straight, evenly and distinctly dentate; anterior corner of carina prominent, sharply angled or with a distinct and prominent tooth; lateral margin distinctly and evenly dentate; posterior corner produced on middle and posterior segments into a spur-like process which projects caudad but not laterad beyond the general line of the lateral margin; dorsum strongly convex; first segment ecarinate; copulatory legs not approximate, conic, rather short, branched immediately above the hairy basal portion; terminal rami subequal in length, the posterior nearly straight, the anterior turned mesad to meet its fellow and decurved so that the apex is nearly in contact with the base: Genus *Mniodesmus*, type *Mn. crossotus*, *sp. n.*, Java.

Last segment broad and subquadrate, the apex not narrowed; truncate or very broadly rounded; setiferous tubercles not prominent, and not remote from the posterior margin; carinæ with anterior margin somewhat rounded and entire, or straight, with very numerous fine irregular teeth; anterior corner rounded and without a prominent tooth or angle; lateral margin sparsely and irregularly dentate, sinuate or subentire; posterior corner slightly produced or with a large spur-like process projecting caudad and laterad beyond the anterior part of the lateral margin; dorsum slightly or moderately convex; first segment more or less carinate, that is, with a more or less developed lateral process; copulatory legs more or less approximate, the anterior ramus not recurved.

Transverse constriction (suture) costulate (crenulate); pores adjacent to the margin; lateral margins of carinæ sparsely and irregularly dentate and apparently deeply excised, from the fact that the long spur-like process of the posterior corner extends laterad as well as caudad; carinæ rather narrow, about one-third as wide as the body-cylinder; dorsum with three distinct though inconspicuous rows of tubercles: Genus *Xerodesmus*, type *X. dratus*, *sp. n.*, Java.

Transverse constriction not costulate; poriferous ring distant from the margin by a space equal to its diameter; lateral margins of carinæ slightly and broadly sinuate, not excised; the posterior corner square, not produced into a spur-like process; carinæ broad, equal to half the body-cylinder; dorsum densely and evenly granular, the tubercles obsolete: Genus *Acanthodesmus* Peters, type *A. pilipes* (Peters), Borneo.

The types of *Acanthodesmus pilipes* are at Berlin, but both are females. The character of the copulatory legs has accordingly been inferred from *A. andersonii* Poc.*, which appears to be at least congeneric with *pilipes*.

The preceding table by no means exhausts the Oriental genera of this group as represented more conspicuously in the various papers of Mr. Pocock. Some of these can, it would seem, be safely indicated from that author's excellent descriptions and plates, and the following table may be looked upon as supplementary, being intended to point out the differential characters of some of the forms which present the more striking divergencies from the genera established above.

Copulatory legs with three prongs; sterna not spined; lateral margin of carina with 4-6 rounded tubercles; posterior corner of carina not produced into a sharp spur; anterior and posterior margins of carinæ smooth: Genus *Zodesmus*, type *Z. tuberosus* (Poc.†), Ki Islands.

Copulatory legs with two prongs, or the sterna spined.

Lateral carinæ deeply bidentate, the pore located at the base of the anterior tooth: Genus *Dicrodesmus* Silvestri‡, type *D. bidens* (Poc.), Sumatra.

Anterior segments, at least, not bilobed, the others not deeply so, with the lobes and sinus more or less denticulate.

Carinæ projecting obliquely forward so that even on the seventeenth segment the posterior corner does not project farther back than the posterior margin of the segment: Genus *Prodesmus*, type *Pr. submissus* (Poc.), Sumatra.

Segments in front of the seventeenth with the carinæ curved or produced farther caudad than the middle of the segments.

Sterna spined; copulatory legs with three prongs not greatly unequal in length: Genus *Cradodesmus*, type *Cr. subspinosus* (Poc.)

Sterna not spined; copulatory legs with two prongs.

Carinæ of middle segments deeply and broadly excised; the pore located close to the edge: first segment with carinæ short, directed backward and upward; dorsal surface nearly smooth: *Leucodesmus*, type *L. weberi* (Poc.), Sumatra.

Carinæ not excised, the poriferous ring remote from the edge by about its own diameter; first segment with carinæ longer, not directed caudad; dorsal surface densely granular: Genus *Harpodesmus* type *H. laticollis* (Poc.), Sumatra.

* Ann. Mus. Civ. Genova (2) XIV, p. 788, 1895.

† Ann. & Mag. Nat. Hist. (6) XV, p. 131, Pl. IX, figs. 3-3 b, 1893. The other species of this table are to be found in Weber's Reise, pp. 345-357.

‡ Ann. Mus. Civ. Genova (2) XVI, p. 190, 1896. This paper came to hand after I had sent the same genus to the printer under another name. Two other genera are proposed in the same place: *Cyrtorrhachis*, type *Platyrrhacus subalbus* Poc., and *Acisternum*, type *Platyrrhacus monticola* Poc., the first from Java, the second from Sumatra.

Under *Phyodesmus* will be included, for the present at least, all the large forms related to *P. pictus*, such as *P. mirandus* (Poc.), *P. pfeifferæ* (H. & S.), *P. princeps* (Gerv.), *P. magnificus* (Silvestri), and two new species in the Berlin Museum, *P. petersii* (No. 268) and *P. montrado* (No. 267). These last were among the specimens indicated by Peters as types of *pictus*, from which both differ in their smaller size and shorter copulatory legs with a broader ensiform proximal ramus and a large process from the longer arm. From each other they differ in that *petersii* is more slender and with the branches of the copulatory legs much longer in proportion to the proximal hairy portion of the last joint.

The genus *Phractodesmus* is distinguished in the possession of exceedingly large sternal spines, while its other characters are not remarkable.

The "types" of *Psaphodesmus concolor* are also numerous and include several species. Among them was found the specimen (No. 280) upon which was established the genus *Derodesmus*. The copulatory legs of this last are peculiar in the long slender last joint, hairy about half its length, with the terminal portion entirely unbranched, but coiled nearly in a circle. Dorsally the specimen is sculptured much as in *concolor*, but it is much smaller and less convex. As the true type of *concolor* may be taken the first specimens indicated by number (241). The specimens from Dodinga (No. 243) are much larger in size and nearly black in color, even to the copulatory legs. These it is proposed to describe as *Psaphodesmus dodinga*. The genus nearest related to *Psaphodesmus* is probably *Zodesmus*, which supposition is in accordance with what little is known of the geographic distribution. The type of *Leurodesmus* has, as Peters declared, much external resemblance to certain South American forms placed under *Rhacophorus*, but it is without doubt a member of the present family.

It is perhaps too early to attempt the subdivision of the *Platyrrhacidae* into groups of higher than generic rank, and yet it is evident that there is little close relationship between the Malayan and South American forms. Especially is this the case in such instances as *Phyodesmus*, *Taphodesmus* and *Psaphodesmus*, which can safely be recognized as types of at least subfamily importance. The *Phyodesmini* and *Taphodesmini* include as yet but a single genus each. *Taphodesmus*, though known only from a fragment, is so peculiar that further specimens may easily justify the establishment of a distinct family. To the *Psaphodesmini* may be referred *Derodesmus* and *Zodesmus*, while the remaining Malayan genera can be provisionally included in the *Acanthodesmini*, from which the separation of other subfamilies will doubtless be found convenient.

II.

ON RECENT DIPLOPOD NAMES.

An attempt at an arrangement of the diplopod families and genera was published in the preceding year *, as an introductory note to a revision of the American Craspedosmatidæ. Apparently without having seen this paper Sig. Filippo Silvestri has recently prepared † a similar list in which many new families and genera are proposed, several of which were already provided. Other genera not included in my arrangement have been published by Pocock, Verhoeff, Brölemann, and Porat, all of which appear in Sig. Silvestri's alphabetical list with the exception of four of Mr. Pocock's genera of Zephroniidæ ‡. Of this list the following names are believed to be unavailable, or exception is taken to their disposition by some of the writers mentioned.

APORODESMUS Porat, 1894.

The type of Pocock's genus of the same name is *A. vicentii* Poc., from the West Indies, and this is in all probability not congeneric with *A. gabonicus* (Lucas), whatever that may be, which stands as the type of *Aporodesmus* Porat. Moreover, Porat's genus appears to be older than Pocock's by several months, so that the name must be reserved for the African form; accordingly *vincentii* of Pocock may be given the new generic name *Docodesmus*.

ATTEMSIA Cook, 1895.

Since recognizing Verhoeff's subgenus as worthy of generic rank, I have seen specimens from the Adelsberger Grotte, in all probability referable to *A. stygia* (Latzel). They were not congeneric with the types of *Craspedosma rawlinsii* in the British Museum.

BOLLMANIA Silvestri, 1896.

Unfortunately, this name has been used for a genus of fishes; for the genus of Lysipetalidæ may be substituted Trypostrephon, *nom. nov.*, with *T. orientalis* (Silvestri) as type.

* Ann. N. Y. Acad. Sci. IX, pp. 1-4, October 1895.

† Ann. Mus. Civ. Genova (2) XVI, March 1896.

‡ Zoosphærium, Arthrosphæra, Castanotherium, and Cyliosoma, Ann. & Mag. Nat. Hist., (6) XVI, Nov. 1895, pp. 410-414.

CAMPODES C. L. Koch, 1847.

As has been pointed out in the paper on the Craspedosomatidæ, this genus belongs to the Iulidæ. European writers have adopted Bollman's identification of *Cryptotrichus* with *Campodes*. Silvestri goes so far as to make a family *Campodidæ*, although this name is preoccupied in the *Thysanura*. *Cryptotrichus* is also preoccupied and has been replaced by *Cleidogona*. In a paper soon to appear in the *American Naturalist* a family *Cleidogonidæ* has been recognized, to contain the American genera *Cleidogona*, *Bactropus*, and *Pseudotremia*.

DORATONOTUS Pocock, 1894.

This name has been used by Guenther for a genus of fishes, and was replaced by *Doratodesmus*.

HAPLOSOMA Verhoeff, 1893.

This name is also preoccupied and was changed to *Haplodesmus*, the family to *Haplodesmidæ*. Verhoeff has also recently published a genus of *Geophilidæ* which he calls *Haplogaster*. This name is at least twice preoccupied and may be replaced by Haplophilus. *new name*

MACROTRICHUS Silvestri, 1896.

With this name Silvestri proposes to replace *Poratia* Verhoeff, preoccupied. The deficiency had already been supplied by *Mastigona* Ck., 1895.

PÆROMOPUS Karsch, 1881.

This genus is discarded by Silvestri. It is not only valid, but should be given family rank under the name *Pæromopodidæ*.

PIESTODESMUS Lucas, 1849.

This genus has been given as a synonym of *Platydesmus* Lucas, 1843, but the locality, description, and plates would seem to forbid an inference of relationship with *Polyzonium* Brandt, to which Silvestri has reduced it. It is probably a valid genus.

PSEUDOIULUS Bollman, 1887.

This genus is recognized as valid by Silvestri, although Bollman established it only as a subgenus and later withdrew it as having been based on an immature form*.

RHACHIS Saussure, 1859.

Preoccupied; replaced by *Rhacodesmus* Ck., 1895; the only species is *Rhacodesmus viridis* (Saussure).

THRINCIULUS Porat, 1895.

The author of this genus takes *Acanthiulus murrayi* Poc. as his type, but applies the name to African species related to those described

* Bull. 46 U. S. Nat. Mus. p. 138.

by Karsch under *Glyphiulus* which according to Pocock is related to *Trachyiulus* Peters. *Acanthoiulus* is one of the *Spiroboldæ*, and *Thrinciulus* must stand as a synonym, unless *murrayi* proves to be generically distinct from *blainvillei* LeGuillou. At any rate, *Thrinciulus* will be a genus of *Spiroboldæ*, while Porat's Kamerun species are to be included in a genus *Lophostreptus**, based on *L. magnus* (Karsch); I have compared the type with several specimens from Kamerun. The other species of *Glyphiulus* described by Karsch, *G. scalatus*, is the type of a related genus to be called *Anastreptus*.

TRACHYSOMA Attems, 1895.

This name is preoccupied and has been replaced *Trachygona*; a family *Trachygoniidæ* has also been recognized.

VERHÖEFFIA Brölemann, Dec. 1895.

This name was given to supply the place of *Latzelia* Verhoeff, but *Haplogona* Ck., proposed for the same purpose was already printed (Oct. 1895).

The synonymy of some of the families recognized by Silverstri is as follows: *Trachysomidæ* Silverstri = *Trachygoniidæ* Ck.; *Campodidæ* Silverstri = *Cleidogoniidæ* Ck.; *Trachyiulidæ* Silverstri, 1896 = *Cambalopsidæ* Ck., 1895; *Nemasomidæ* Silverstri, 1896 = *Isobatidæ* Ck., 1895; *Pyrgodesmidæ* Silverstri, 1896 = *Stylodesmidæ* Ck., 1895 (probably); *Gervaisidæ* Silverstri, 1896 = *Gervaisiidæ* Ck., 1895; *Haplosomidæ* Silverstri, 1895 = *Haplodesmidæ* Ck., 1895; *Sphærotheriidæ* C. L. Koch, 1847 = *Zephroniidæ* Gray, 1842.

Family CYCLODESMIDÆ Silverstri, 1895.

If we are to follow this author, his family must be reduced to *Oniscodesmidæ* Saussure, 1860, for *Oniscodesmus* is one of four genera which he includes in it. The others are *Cyclodesmus*, *Cyrtodesmus*, and *Doratotonus* (= *Doratodesmus*). After an examination of all four genera I am convinced that there is no family relationship unless it lies between *Oniscodesmus* and *Cyclodesmus*. On *Cyrtodesmus* and *Doratodesmus* the families *Cyrtodesmidæ* and *Doratodesmidæ* are established.

Family HAPLOSOMIDÆ Silverstri, 1895.

Under this name Sig. Silverstri includes a miscellaneous assemblage of all known diplopod genera with nineteen segments. Even *Paradoxosoma* Daday is among the number, although a family *Paradoxosomatidæ* was established six years in advance of the *Haplosomidæ*.

* Ann. N. Y. Acad. Sci. IX, p. 5, 1895.

NOTE ON THE FAMILIES OF CHORDEUMATOIDEA.

A further examination of the relationships of the higher groups of Diplopoda has resulted in the separation of an order Cœlocheta from the Merocheta *, and of an order Zygocheta from the Diplocheta. The Cœlocheta will contain three suborders, the Lysiopetaloidea (Calipodoidea), the Striarioidea (*nov.*), and the Chordeumatoidea; the true Iulidæ and their allies comprise the Zygocheta.

In the Chordeumatoidea several families may be distinguished as follows:

Family CHORDEUMATIDÆ C. L. Koch, 1847.

Genera: Caseya, Chordeuma, Melogona, Mycogona, Underwoodia.

Distribution: Europe and North America.

84

Family CRASPEDOSOMATIDÆ Gray, 1842.

Genera: Aporogona, Atractosoma, Attemsia, Basigona, Bomogona, Chelogona, Craspedosma, Grypogona, Haasea, Haplogona, Iulogona, *nov.*, type *I. tyrolense* (Atractosoma Verhoeff), Ochogona, Ornithogona, *nov.*, type *O. helvetica* (Atractosoma Verhoeff), Phanogona, Rhymogona, *nov.*, type *Rh. montivaga* (Atractosoma Verhoeff).

Distribution: Europe.

89

Family CLEIDOGONIDÆ Cook, 1896.

Genera: Cleidogona, Bactropus, Pseudotremia.

Distribution: Eastern North America.

97

Family CONOTYLIDÆ, *nov.*

Genera: Conotyta, Trichopetalum, Zygonopus, Scoterpes.

Distribution: Eastern North America.

Family TRACHYGONIDÆ Cook, 1896.

Genera: Rhiscosoma, Trachygona.

Distribution: Europe.

Family BRANNERIIDÆ, *nov.*

Genus: Branneria.

Distribution: Eastern North America.

Family HETEROCHORDEUMATIDÆ Silvestri, 1895.

Genera: Heterochordeuma, Pocockia.

Distribution: Malaysia.

* American Naturalist, Dec. 1895, p. 1115.

III.

THE GENERA OF OXYDESMIDÆ.

An analytical key to the genera of this family was published some months since *, but the study of more extensive and better material has led to the recognition of several new generic groups. The family has also been limited by the separation of some of the forms previously included, these being assigned to a new family called Prepodesmidae †. The diagnostic characters of the genera now recognized are indicated in the following table, to which is appended a list of the species. A monograph of the family will appear in a few months.

KEY TO THE GENERA OF OXYDESMIDÆ.

Dorsum densely beset with 4 to 6 transverse rows of coarse tubercles: Genus *Scytodesmus* Ck., Kamerun.

Dorsum smooth, granular, or with three rows of polygonal areas, each with a large tubercle in the middle.

Submarginal ridge very oblique, broad and not prominent, remote from the margin; pores in a broad, shallow depression in the middle of the ridge, hence also remote from the margin: Genus *Plagiodesmus* Ck., Congo Valley.

Submarginal ridge nearly or quite longitudinal, parallel with and adjacent to the margin; pores also not remote from the margin, located in the outer slope of the submarginal ridge.

Apical margin of last segment transverse and very broad, the lateral margins parallel, convex, or divergent caudad; apex proper also very broad, equaling in width the four setiferous tubercles, which are also located on the posterior margin and are not greatly exceeded by the apex: Genus *Lacnodesmus*, nov., type *L. campii* (Ck.), Congo Valley.

Apical margin of last segment more or less rounded or triangular in general outline, the lateral margins more or less converging caudad; apex proper distinctly narrowed and exceeding the tubercles, one or both pairs of which appear to rise from the lateral margin: the posterior marginal tubercles at least projecting much farther caudad than the anterior, except in certain East African forms where the tubercles are greatly developed.

Dorsum smooth and shining; under a lens finely rugulose or coriaceous; no granules, tubercles or areas: Genus *Mimodesmus* Ck., East Africa.

Dorsum with more or less conspicuous granules, tubercles, and areas.

Segments with the tubercles not specially modified or increased in size; copulatory legs bent at the middle of the last joint, and the apices inserted under the anterior edge of the large aperture: Genus *Oxydesmus* (H. & S.), West Africa.

Segments 1-4, or some of them, with at least the median posterior tubercles hypertrophied; copulatory legs extended and exposed.

*Proc. U. S. Nat. Mus. XVIII, p. 99, 1895.

† American Naturalist, XXX, p. 415, 1896.

Anterior segments dorsally somewhat thickened, raised and prominent over a bright-colored median area occupied by several mesial tubercles of each of the last two rows; tubercles of anterior segments not conspicuously enlarged or coalesced into ridges or processes: Genus *Lyodesmus*, *nov.*, type *L. zoster*, *sp. n.*, East Africa.

Some or all of the anterior segments (1-4) with the median or posterior tubercles conspicuously enlarged.

Segments 1-4 with the median and especially the posterior tubercles evidently hypertrophied, but not coalesced in the median line: Genus *Rhodomus*, *nov.*, type *Rh. priodus*, *sp. n.*, East Africa.

Segments 1-4, or some of them, with a conspicuous median process formed by the coalescence of two or more of the posterior tubercles.

Third segment only with a process; this is comb-like, very large, and recurved so as to cover entirely the median part of the fourth segment: Genus *Ctenodesmus*, *nov.*, type *Ct. gibber*, *sp. n.*, East Africa.

Processes of first and second segments distinct, equal to or smaller than that of the third segment.

Segments 2-3 with the two median tubercles of the posterior row enormously hypertrophied into a long, slender, recurved, canaliculate process; the first segment has also a small process: Genus *Ceratodesmus*, *nov.*, type *C. ansatus*, *sp. n.*, East Africa.

Process not long, slender, and recurved; appearing rather in the form of a transverse crest of enlarged tubercles coalesced at base, and scarcely projecting beyond the posterior margin of the segment.

Fourth segment normal; copulatory legs slender, the two principal rami extended into long, slender, falcate, approximate, incurved processes; a slender ventral ramus extends mesad and distad to meet or cross its fellow: Genus *Phobodesmus*, *nov.*, type *Ph. cristatus*, *sp. n.*, East Africa.

Fourth segment with a distinct process similar to that of the third; copulatory legs pedicellate, stout, not deeply divided into slender rami: Genus *Orodesmus* Ck., East Africa.

LIST OF SPECIES.

1. *SCYTODESMUS KRIBI* Cook; Kamerun; Berlin Museum.
2. *SCYTODESMUS CONNIVENS*, *sp. n.* Smaller and more convex than *Sc. kribi*; lateral carinæ narrower, the edges with four or five sharp teeth; copulatory legs similar to those of *Sc. kribi*, but shorter and more robust; length about 18 mm., width 5 mm.; locality Bismarckburg, Togo Colony, collected by Conradt; Berlin Museum.
3. *PLAGIODESMUS OBLIQUUS* Cook; Congo Valley; British Museum.
4. *PLAGIODESMUS OCCIDENTALIS* (Karsch); Quango; Berlin Museum.
5. *LACNODESMUS CAMPII* (Cook); Congo Valley; U. S. Nat. Museum.
6. *LACNODESMUS VALGUS*, *sp. n.* Very distinct from the other species in size, dorsal sculpture, and form of copulatory legs. Segments with tubercles slightly developed, appearing as broadly rounded or flattened rugulose prominences or convex areas; last segment with sides diverging, though the apex proper is rather narrow; copulatory legs with the apical arms more crassate and the lateral spine longer than in *L. campii*; length 70 mm.; locality Africa; Philadelphia Academy.

7. LACNODESMUS FLABELLATUS (Cook); Congo Valley; U. S. Nat. Museum.
8. LACNODESMUS ITURI, *sp. n.* Rather closely relating to *L. flabellatus*, and of the same size and uniform dark color; last segment with the sides scarcely diverging and apically narrower than in *L. campii*; segments 18-19 with their posterior corners narrower and more produced than in *L. campii*; locality Ituri Fæhre, northwest of Albert Nyansa; Stuhlmann; Berlin Museum.
9. LACNODESMUS THYRIDOTUS, *sp. n.* Size and general appearance somewhat that of *L. valgus*; differing in the greater convexity of the dorsum (possibly a sexual character), the slight development of the dorsal tubercles and areas, the greater prominence of the submarginal ridge, the more rounded posterior corners of the carinæ, less produced on posterior segments, and the shorter last segment with the two large marginal tubercles much less developed than in *L. valgus*; color nearly black, a small, transversely rectangular light spot on each anterior subsegment, divided by a fine dark median line; length about 70 mm.; locality Jaunde Station, Kamerun; Berlin Museum.
10. OXYDESMUS AFER Gray; Senegambia; British Museum.
11. OXYDESMUS ASABA, *sp. n.* Dorsum with tubercles distinct, though not prominent; carinæ with submarginal ridge moderately prominent, close to the margin, which is entire, or slightly sinuate on poriferous segments; pores opening obliquely outward, the surrounding depression very slight; color of anterior subsegments nearly black, of posterior dull yellow with a longitudinal band of black on each side at the base of the carina; length 45 mm., width 7 mm., the smallest species of the genus; locality Asaba, River Niger; British Museum.
12. OXYDESMUS BAROMBI, *sp. n.* Differs from *O. johnstonei*, *sp. n.* in the smaller size, the absence of the prominences of the vertex, the less convex segments, and the less prominent submarginal ridges; color lighter than in *O. johnstonei*, dark coffee brown, sometimes lighter mesially; legs and antennæ concolorous; male 60 mm. by 10 mm., female 66 mm. by 11 mm.; Barombi Station, Kamerun; Berlin Museum.
13. OXYDESMUS CAFFEROIDES (Mattozo); Cabinda; Lisbon Museum.
14. OXYDESMUS DENTATUS, *sp. n.* Segments dorsally densely granulate, the three rows of tubercles prominent, more so than in any other species here referred to Oxydesmus; carinæ with edges distinctly sinuate-dentate; submarginal ridge smooth, prominent, broad; pores removed from the margin by about four times the diameter of the rim; color black, the submarginal ridge bright yellow; antennæ and ventral surface reddish; length about 60 mm., width 10.5 mm.; Africa; British Museum, a single female.
15. OXYDESMUS DOLLFUSSII, *sp. n.* Segments with surface smooth and shining, faintly and sparingly rugulose, divided into three rows of large areas with or without low tubercles; carinæ with submarginal ridge broad, especially on poriferous segments; not sharp above, the pore in a depression of its highest part; last segment with apex thickened, smooth and shining below, the apical setigerous punctations very close together; color uniform, rather dark, dull, *terra cotta* red, tinged with pink below; length 85 mm.; locality Africa; British Museum.
16. OXYDESMUS DORSALIS (Murray); locality unknown.

17. OXYDESMUS FLAVOMARGINATUS (Peters); "America?"; Berlin Museum.
18. OXYDESMUS FUAMBO, *sp. n.* Segments with the surface granular-uneven, the areas rather distinct; tubercles distinct, though slightly prominent, scarcely more so than in *O. lævis*; last segment with the apex squarely truncate, on each side three tubercles projecting from the strongly converging margins; carinæ with very entire and evenly rounded margins; copulatory legs differing from those of all other Oxydesmi in that the lamella is bent backward (downward) at a right angle; the apex is then curved forward and has distally a deep rounded notch; the lamella is not inserted under the edge of the aperture as in the other species, but lies on it, while the slender ramus is inserted as usual; color black, shading into reddish; the carinæ bright yellow, and a dull yellowish median spot along the posterior margin of each segment; length 45 mm., width 9 mm.; locality Fuambo, near Lake Tanjanika; British Museum.
19. OXYDESMUS GRANULOSUS (Beauvois); Oware.
20. OXYDESMUS GRAYII (Newport); Sierra Leone; British Museum.
21. OXYDESMUS JOHNSTONEI, *sp. n.* Vertex with two large prominences, the summits of which are hirsute with long hairs; segments rugulose, the areas well defined, the tubercles large; submarginal ridge sharp and prominent, close to the finely and widely serrulate edge; pores in a deep depression in the middle of the submarginal ridge; last segment rounded and not emarginate at apex; copulatory legs without the proximal branch or process of *O. grayii*; color black; length 80 mm., width 12 mm.; Rio del Rey; British Museum.
22. OXYDESMUS LÆVIS, *sp. n.* Similar to *O. afer*, but smaller and smoother. Segments dorsally indistinctly coriaceous, not granular, apparently smooth and shining; tubercles obsolete; carinæ evenly rounded, the ridge moderately broad and high; color nearly black, with the lateral half of each carina yellow, antennæ and legs bright pinkish; length of male 53 mm., width 9.5 mm, the anterior segments widest; Togo Colony, apparently common; Berlin Museum.
23. OXYDESMUS LIBER Cook; Liberia; Berlin Museum.
24. OXYDESMUS MEDIUS Cook; Liberia; Berlin Museum.
25. OXYDESMUS THOMSONII (Lucas); Liberia; type in Paris?
26. OXYDESMUS TOGOENSIS Cook; Togo Colony; Berlin Museum.
27. OXYDESMUS TRICUSPIDATUS (Peters); Guinea; Berlin Museum.
28. OXYDESMUS TUBERCULIFRONS Porat; Kamerun; Stockholm Museum.
29. OXYDESMUS VALDAUI Porat; Kamerun; Stockholm Museum.
30. OXYDESMUS VITTATUS, *sp. n.* Segments with three rows of rather large tubercles; submarginal ridge moderate, not sharp above; lateral margin entire; color dark brown, a median stripe of light coffee-and-milk brown, broader on posterior subsegments and occupying nearly half the width of the subsegment; length 70 mm., width 11 mm.; Cameroons and Old Calabar; British Museum.
31. OXYDESMUS XANTHOMELAS, *sp. n.* Evidently nearest related to *O. dentatus*; differing in the very slightly development of the low, rounded, tubercles and in the possession of a broad, rectangular, median yellow spot occupying the posterior half of that part of the dorsum: length of female 65 mm., width 11.5 mm.; Kilmanjaro; U. S. Nat. Museum.

32. *LYODESMUS ZOSTER*, *sp. n.* Segments dorsally with tubercles moderately prominent, especially those of the two posterior rows near the middle of the dorsum; posterior margin on anterior segments somewhat raised in the middle, but no distinct process; submarginal ridge prominent, rather broad, rounded and not sharp above; pores located in a slight depression in the outer slope; margins of carinæ sinuate or subdentate; copulatory legs subsimilar to those of *Oxydesmus*, forcipate, the broader mesial division deeply notched distally, the lateral division robust, incurved; color probably brownish, the submarginal ridge and a median spot on the posterior margin of each segment yellowish; length about 50 mm., width 9 mm.; locality Kawende, East Africa; Berlin Museum.
33. *LYODESMUS FLAVOCARINATUS* (Silvestri); Juba River, East Africa; Genoa Museum.
34. *LYODESMUS FISCHERI* (Karsch); Massai Land; Berlin Museum?
35. *LYODESMUS EFFULGENS* (Karsch); Somali Land; Berlin Museum.
36. *RHODODESMUS PRIODUS*, *sp. n.*, Somewhat more slender and rougher than the other species; anterior segments with median tubercles much enlarged, sharply conic; dorsal surface beset with very distinct granules arranged in clusters about the tubercles, and sometimes almost equaling these in size; lateral carinæ very long, the angles sharp and with four or five distinct teeth between; color dark reddish brown; length 36 mm., width 5.8 mm.; Dar es Salaam; Berlin Museum.
37. *RHODODESMUS UNICOLOR* (Cook); Mombassa; Berlin Museum.
38. *RHODODESMUS MASTOPHORUS* (Gerstæcker); Mombassa; Berlin Museum.
39. *CERATODESMUS ANSATUS*, *sp. n.* Somewhat similar to the preceding species, but the dorsal sculpture less pronounced; first segment with the two middle tubercles of the last row coalesced into a distinct, though small process; second and third segment with a long, narrow, recurved process; carinæ with angles sharp, the lateral margin irregularly dentate; posterior margin with numerous fine, sharp teeth; last segment subtriangular, the sides distinctly converging, the marginal tubercles well developed; color brownish, the carinæ reddish, the dorsal processes bright red; length of female 44 mm., width 7.5 mm.; Tanga, Usambara; Berlin Museum.
40. *CTENODESMUS GIBBER*, *sp. n.* Smaller and more slender than *Ct. pectinatus*; third segment with a more erect and somewhat narrower process composed of four equally hypertrophied tubercles; margins of carinæ with two large teeth between the angled corners; last segment with apex narrow, produced; color uniform reddish black, including the legs and antennæ; length 38 mm., width 5.5 mm.; Jombene Range, East Africa; U. S. Nat. Museum.
41. *CTENODESMUS PECTINATUS* (Karsch); Wito, East Africa; Berlin Museum.
42. *PHOBODESMUS CRISTATUS*, *sp. n.* Second and third segments with a crest-like process rising from the posterior margin; fourth segment quite normal, the median tubercles of the last row scarcely enlarged; lateral margins with 6-8 small, irregular teeth; dorsum nearly flat, the carinæ horizontal; color nearly black, the carinæ becoming yellowish laterad; length of male 45 mm., width 8.4 mm.; Usambara; Berlin Museum.
43. *ORODESMUS FORCEPS* Cook; East Africa; British Museum.
44. *ORODESMUS BICOLOR* Cook; Tana River, East Africa; U. S. Nat. Museum.

45. *ORODESMUS ELLIPTICUS*, *sp. n.* Size and general shape of *Phobodesmus cristatus*, but markedly differing in that the terminal segments are gradually narrower, giving a long-elliptic outline. First segment with two median tubercles of the last row enlarged and coalesced; segments 2-4 with the middle four tubercles of the last row and two of the second row completely coalesced into a large prominence; other tubercles small, the surface of the segments not very densely beset with fine granules, and not rugulose as in other species; lateral margins slightly and irregularly sinuate or faintly dentate; submarginal ridge not very strong, close to the edge; color dark red, the processes of the anterior segments, the median third of the posterior part of the posterior subsegments, and the carinæ, yellowish; submarginal ridge, antennæ, legs, and ventral surface, red; Ngatana, vicinity of Kilimanjaro; British Museum.
46. *ORODESMUS CAMELUS*, *sp. n.* Apparently closely related to *O. bicolor*, but differing in the somewhat larger size, greater dorsal convexity, and in the fact that while the processes of the anterior segments are somewhat more developed than those of *bicolor*, the two middle tubercles are not nearly as large proportionally; colors slightly darker than in *bicolor*; length about 43 mm.; width 8 mm.; Tanga, Usambara; Berlin Museum.
47. *MIMODESMUS PARALLELUS* Cook; Karewia, East Africa; Berlin Museum.

MAY 30, 1896.

IV.

ON THE XYODESMIDÆ, A NEW FAMILY.

Under this name may be arranged several genera the pertinent affinities of which have thus far not been indicated. For example, Dr. C. O. von Porat has identified *Polydesmus erythropus* Lucas* from Kamerun, referring it first to *Oxydesmus*† and then to *Paradesmus*‡. My opinion is that it belongs to neither of these genera, and that the Kamerun species is not that described from Liberia by Lucas. It is proposed to name this new form, and to found on it a new genus, the binomial to be *Scaptodesmus porati*. There is in the Berlin Museum a specimen from Kamerun belonging to an evidently related, though distinct genus. The dorsum is strongly and evenly convex, and densely and finely granular; the lateral and posterior margins of the segments are distinctly and closely serrate-dentate; the pores are borne on a small, distinct, lateral callus on the usual segments. For this the name *Thymodesmus* is proposed; the type species, *Th. pulvinar*, is known only from a female specimen with 19 segments; it measures 23 mm. by 5.25 mm. These genera, together with *Diaphorodesmus* Silv., *Cryptoporus* Prt., and *Xyodesmus* Ck., constitute the African division of the family. There is some resemblance to the *Oxydesmidæ* in the broad anal segment, but even this is, if closely observed, very different from that of any known member of the *Oxydesmidæ*. The location of the pores is also very different, while the special development of the tubercles of some of the anterior segments is a character shared only by the *Oxydesmidæ*.

In South America are three or four genera in all probability more related to each other and to the above African forms than to other American families. I have, for instance, before me the types of *Trachelodesmus* and *Thymodesmus*, and the relationships, while by no means close, appear to be substantial. There are two other South American genera of *Xyodesmidæ*. *Hypodesmus* is nearly related to *Trachelodesmus*, and is founded on *Trachelodesmus constrictus* (Ptrs). The other is established for *Rhachidomorpha alutacea* (Ptrs). To

*Lucas, Myriapodes du Gabon, Thomson's Archives Entomologiques II, p. 442, 1858. "Patrie: cote de Malaguette." This is the "Grain" or "Pepper Coast," a name formerly applied to Liberia.

†Porat, Bih. K. Sv. Vet.-Ak. Handl. XVIII, No. 7, p. 22, 1893.

‡Ibid. XX, No. 5, p. 34, 1894. Porat here proposes to refer even such species as *Rhododesmus mastophorus* (Gerst.) to *Paradesmus*, with the result of bringing members of at least three families into an invalid genus, the type of which belongs to a fourth family, and the name of which is preoccupied.

this series *Peridontodesmus* Silv., founded on *Scytonotus woodianus* (H. & S.) may probably be added. It will be distinguished from the American, and indeed from all the forms mentioned above, by the coarsely dentate segments; but as nothing is known with regard to the location of the pores, it could not well be included in the synopsis. Neither this genus nor *Trachelodesmus* has any apparent relationship with *Scytonotus* C. L. Koch, such affinity having apparently been inferred without an examination of the types.

KEY TO THE GENERA OF XYODESMIDÆ.

Segments 2-3 or 2-4 each with a pair of tubercles hypertrophied into long horn-like processes: Genus *Diaphorodesmus* (Silv.), type *D. dorsicornis* (Prt.), Kamerun.

Segments with tubercles subequal.

Last segment broad and lamellar, basally emarginate on the sides so as to appear constricted; no distinct tubercle or conic process on the sides of the apical portion of the segment: Genus *Cryptoporus* (Prt.), type *Cr. verrucosus* (Prt.), Kamerun.

Last segment with a more or less narrowed truncate apex, and with a more or less distinct marginal tooth or process on each side of the apex proper; in cases where this tooth is small the sides of the apical portion distinctly converge.

Pores located under the apices of the small carinæ of segments 5, 9, 11, 14, 16, facing laterad; sternum of last pair of legs with two long spines; segments 19: Genus *Batodesmus*, *nov.*, type *B. alutaceus* (Ptrs.); Bogota.

Pores, if present, with the usual formula, 5, 7, 9, 10, 12, 13, 15-19; carinæ either not narrowed or only the first three or four; sterna either without spines or those at the base of the last legs are not larger than those on the middle segments.

Repugnatorial pores located in distinct excavations in the lateral margins of the carinæ; dorsum very slightly convex; last segment with the marginal processes very strongly developed: Genus *Scaptodesmus nov.*, type *Scaptodesmus porati*, *sp. n.* (*Paradesmus erythropus* Prt., *non* Lucas), Kamerun.

Repugnatorial pores, if evident, located in a distinct marginal tubercle or callus, or the dorsum is strongly convex and the last segment has the marginal tubercles slightly developed.

All the carinæ broad and moderately long; pores evident, located in a distinct, marginal, bead-like callus: Genus *Thymodesmus*, *nov.*, type *Th. pulverar*, *sp. n.*, Kamerun.

Either the anterior carinæ are evidently shortened, sometimes into spine-like processes, or the pores are not located in a marginal callus.

Segments densely beset with sharply conic granules; the edges of the rather broad horizontal carinæ sharply dentate with somewhat larger cones; anterior segments without enlarged tubercles; last segment with marginal processes well developed; pores obscure; sterna not spined: Genus *Xyodesmus* Ck., type *X. planus* Ck., Togo.

Segments above beset with rounded granules or tubercles; carinæ very narrow; anterior segments shortened, with a transverse row of large tuber-

cles; last segment with marginal processes inconspicuous; pores located on the under side of the carinæ; sterna of the posterior pair of legs of each segment with a long, incurved spine.

Lateral edge of carinæ with a few distinct, rounded tubercles, on the inferior face of the largest of which the pores are located: Genus *Hypodesmus*, nov., type *H. constrictus* (Ptrs.), Bogota.

Lateral edge of carinæ finely granulate or denticulate, the pore located under the most projecting part, but not on a special and distinct tubercle or callus: Genus *Trachelodesmus* (Ptrs.), type *Tr. arcticollis* (Ptrs.), Caracas.

In all the genera of this family the sterna are unusually wide, but the American forms are further remarkable in that the sterna are spined. The absence of such spines characterizes the African sub-family Xyodesmini. The Trachelodesmini are characterized by the robust body, the short and pointed anterior carinæ, the normal pore-formula, and the uniform development of the sternal spines, while Batodesmini have the body slender, all the carinæ narrow and pointed, the remarkable pore-formula, and the development of very long spines on the sterna of posterior segments. The absence of pores from the seventh segment and their presence on the eleventh and fourteenth is a most remarkable character, and in connection with the flattened dorsum, elevated carinæ, and nineteen segments, may easily necessitate the recognition of a monotypic family Batodesmidæ, if forms connecting with Trachelodesmus are not discovered. The typical and only specimen is dry and had been broken and mended with glue. It is not impossible that a segment had been lost, which would modify the latter part of the pore-formula, but as the specimen is a male the want of pores on the seventh segment can be certified.

MAV 30, 1896.

V.

CRYPTODESMUS AND ITS ALLIES.

Under the name *Cryptodesmus* a great variety of forms has been described, many it is believed with no close affinities to each other or to the type of the genus. Much of this confusion has resulted from the fact that the characters of the typical species have thus far remained in doubt, and that the author of the generic name, without giving a satisfactory account of his type, described other unrelated species under *Cryptodesmus*, from which the characters of the genus have been wrongly inferred. To further complicate matters, *Cryptodesmus alatus* (Ptrs.) was not a single species, but the three typical specimens belong to three species and two genera, both very distinct from *Cryptodesmus*. It is here proposed to indicate and briefly characterize these and other new genera.

Family CRYPTODESMIDÆ (Karsch), 1879.

Mitth. Muench. Ent. Ver. p. 143.

The character "pores wanting" seems to apply nowhere in this family; I have found pores in all the African, American, and Asiatic forms examined. It certainly does not apply to the name in the restricted sense in which it is here used. The genus *Cryptodesmus* (Ptrs.) is as yet monotypic, and was based on *Cr. offersii* (Bdt.), a Brazilian species in the Berlin Museum. The antennæ are distinctly clavate; the first segment widely exceeds the head, and has the anterior edge even, but with a regular row of flattish granules just behind the margin all around; it is as wide as the second segment. Segments dorsally ornamented with three regular, transverse rows of small, though distinct, subconic granules, each provided with a hair; the lateral and posterior margins are sinuate-dentate. Pores of the usual distribution, distinct, submarginal, located near the middle of the lateral edge on anterior segments, more remote and farther back on posterior. The dorsal surface has none of the flattened, radiating areas and striations, nor the wide carinæ of the African and other forms which I have proposed to call *Pterodesmidæ*. The relationships of the other Neotropical genera do not seem to lie, however, directly with *Pterodesmus*, but rather with African forms which have two or four longitudinal rows of tubercles enlarged and coalesced to form dorsal crests or carinæ, and which under the following name it is proposed to separate from the *Stylodesmidæ*.

Family HERCODESMIDÆ, *nov.*

These agree with the West Indian forms in that the basal joint of the copulatory leg is inflated to contain and conceal the apical structures, but differ in the presence of dorsal processes or crests, in the location of the pore at the posterior corner of the carina on a special lobe or tubercle, and in having the last segment greatly reduced and concealed in the penultimate. The dorsal surface, and especially the carinæ, show in the American genera radiating lines and areas which in the Hercodesmidæ have disappeared, except a slight trace on the carinæ. The West Indian forms discussed above it is proposed to arrange in a separate family accompanied, however, by a single African genus, *Choridesmus* Ck., known only from Liberia.

Family CHYTODESMIDÆ, *nov.*

In all these genera the pore is located at the base of the posterior lobe or area of the carina; the pore is thus remote from the margin, in the middle or somewhat toward the posterior corner of the carina. The antennæ, while distinctly clavate, are long and slender in comparison with those of the Pterodesmidæ. In all Chytodesmidæ there is a more or less defined median depression or sulcus which does not appear in the Pterodesmidæ. The type of the new genus *Chytodesmus* is *Ch. laqueatus* (Ksh.), a Cuban species in the Berlin Museum. The dorsum is strongly and evenly convex, the carinæ being narrow and depressed in the direction of the dorsal arch. Segments ornamented with three transverse rows of convex, smooth and shining areas which are rounded or polygonal in shape, only those of the carinæ showing the radial form. Pores large and distinct; all poriferous carinæ have four marginal areas, the others three.

Genus STICTODESMUS, *nov.*

The type is *St. creper*, *sp. n.*, from Bogota, in the Berlin Museum; it is the smallest of the three "types" of *Cryptodesmus alatus* (Ptrs). Much smaller and less convex than *Chytodesmus*, and with the dorsal ornamentation consisting of a few poorly defined large areas. The head is not entirely concealed by the first segment. Pores with a rather large orifice opening laterad just in front of the last marginal sulcus of the carina; all poriferous carinæ with four lobes, the others with three; the first notch or sinus of the posterior margin on each side is very deep. Length 4.2 mm.; width about .8 mm.

Genus DOCODESMUS Cook, 1896.

Brandtia, p. 5.

Type *D. vincentii* (Poc.), from St. Vincent, West Indies, in the British Museum. The form of the segments and great width of the

horizontal carinæ suggest the Pterodesmidæ, but the presence of four longitudinal rows of distinctly more prominent areas or granules renders diagnosis easy. Although Mr. Pocock desired to call this genus *Aporodesmus*, the pores are present as stated under the family, but are difficult of determination on account of the fact that the whole dorsal surface is covered with a fine bloom or villosity. All poriferous carinæ are four-lobed except those of the fifth segment. Last segment truncate at apex and with a distinct rounded lobe on each side.

Genus *TRIDESMUS*, *nov.*

Type *Tr. sectilis*, *sp. n.*, from Porto Rico in the Berlin Museum. Similar in size and shape to the preceding, but with the dorsal sculpture less defined; the poriferous segments are three-lobed like the others, to the fifteenth. Segments 15-19 are obscurely four-lobed. The posterior area of poriferous carinæ is much enlarged and somewhat produced, instead of rounded as in *Docodesmus*. Last segment very small, triangular, entire, rounded at apex, and scarcely exceeding the produced carinæ of the next preceding; the sinus of the nineteenth segment is also much narrower than in *Docodesmus*.

Family PTERODESMIDÆ Cook, 1896.

American Naturalist XXX, p. 417.

All the members of this family are distinguished by the possession of very broad, nearly entire, radiately impressed carinæ, and by the location of the pores in the anterior part of the carinæ, sometimes near its anterior edge. The antennæ are short and strongly clavate.

Genus *APORODESMUS* Porat, 1894.

Bih. K. Sv. Vet-Ak. Handl. XX, No. 5, p. 41.

To this Porat refers three species, probably representing as many genera. The author bases his genus on *Polydesmus gabonicus* Lucas, but does not seem to have examined the type, without which precaution identification is mere conjecture, for Lucas' description will apply to many of the Pterodesmidæ. If the view be taken that the type of *Aporodesmus* is not necessarily *gabonicus*, but rather the form which Porat calls *falcatus*, it may prove necessary to place *Compsodesmus* Ck. as a synonym of *Aporodesmus*, but as the copulatory legs, pores and other important characters of *falcatus* are still unknown, such a reduction might easily prove a mistake. In the meantime two forms which Porat has distinguished and figured under *gabonicus* may be safely taken up as good species under the names suggested, *Aporodesmus falcatus*, *sp. n.*, and *A. subrectangulus*, *sp. n.* According to Porat the seventh joint of the antennæ is much shorter than the sixth, and in the African "Cryptodesmidæ" the fifth joint of the antennæ

is twice as long as the sixth. Neither of these statements will apply to any of the Kamerun Pterodesmidæ* known to me. Porat also describes the coxæ as produced, but his figures show that the sterna are intended.

*The Kamerun Pterodesmidæ of the Berlin Museum are as follows:

COMPSODESMUS PERLATUS Cook; Jaunde Station. The larger of two new female specimens from the same locality. Measures 23.5 mm. by 8 mm.

COMPSODESMUS LIMACINUS, *sp. n.* Strongly and uniformly convex, the carinæ decurved in the direction of the dorsal arch; all carinæ somewhat falcate, with the posterior corners sharp and produced caudad; sterna sparsely granulate, deeply impressed; on posterior segments the sternum of the posterior pair of legs bears two conic processes, distinct on the sixteenth segment, long and devaricate on the seventeenth, small, pointed and approximate on the eighteenth. Color in alcohol horn brown, moderately light; length 33 mm., width 10 mm.; Jaunde Station, Coll. Zenker, a single female specimen. This is the largest and broadest known member of the Pterodesmidæ, though *C. perlatus* is broader in proportion to its length. The size and more convex dorsum render *C. limacinus* strikingly distinct from all related forms.

COMPSODESMUS CUPULIFER, *sp. n.* Dorsum flat, scarcely convex in the middle, the carinæ horizontal; anterior segments with posterior corner scarcely produced; sterna scarcely granular or pilose, without conic processes; copulatory legs much as in *C. pulcher* Ck., short and simple, with a large distal cup-like excavation; color dark brown above, whitish below; length 26.5 mm., width 7.5 mm.; locality Barombi Station.

COMPSODESMUS SPINATUS, *sp. n.* Dorsum nearly flat, the median convexity greater than in *cupulifer*, less and narrower than in *perlatus*, with which there is agreement in outline and in the strongly falcate carinæ; the radiating and other dorsal areas are somewhat more convex than in *perlatus*, but not so heavily pigmented as in that species; posterior sterna (13-18) distinctly spined, the spines of segments 16 and 17 largest, the spines generally somewhat better developed than in *perlatus*, in which the same segments bear spines; preanal scale with setiferous tubercles shorter than in *perlatus*; length 18.5 mm., width 6.5 mm.; Barombi Station. The copulatory legs are much as in *perlatus*, with the distal excavation deeper and the posterior spine slightly less developed.

COMPSODESMUS KUAKO *sp. n.* Perhaps doubtfully referable to the present genus; differing from the other species in the more slender form and somewhat deficient dorsal sculpture. The copulatory legs are very similar to those of the last species, but lack the spine at the posterior corner of the apical excavation. Dorsum somewhat convex in the middle, the carinæ distinctly ascending so that their margins are as high as the middle of the dorsum; three rows of convex areas on the convex median portion; carinæ smooth except for the radiating marginal impressions; pores distinct; sterna narrow, very minutely roughened and pilose, scarcely produced caudad. Color translucent whitish in alcohol, apparently unpigmented and probably white in life, as in *Gypsodesmus*; length about 18 mm., width 4.5 mm.; "*Kuako bis Kimpoko*," Congo, a single male specimen collected by Buettner. This is the only member of the Pterodesmidæ yet known from the Congo Valley.

In addition to the six African genera Aporodesmus, Pterodesmus, Lampodesmus, Gypsodesmus, Compsodesmus, and Tanydesmus there may be referred to this family the following from South America.

Genus CHONODESMUS, *nov.*

The type is *Ch. alatus* (Ptrs.), one of the three specimens on which his *Cryptodesmus alatus* was founded. The remaining specimen of the three it is proposed to recognize provisionally as a second species of Chonodesmus, under the name *Chonodesmus regularis*, *sp. n.* This differs from *Ch. alatus* in the more equal size and more regular distribution of the dorsal elevated areas, each of which bears a hair of considerable length. The carinæ are less horizontal, so that the dorsum appears more convex, with the median arch less abruptly prominent than in *Ch. alatus*. The pores are located in exactly the same way, that is, in front of the middle of the carina, somewhat remote from the margin, opening laterad on the side of a small granule.

There is a large series of Indian and Malayan forms referable to the Pterodesmidæ. Mr. Pocock has already defined a few genera as distinct from Cryptodesmus, but the bulk of his descriptions stand under that name. In a small collection of Javan Diplopoda which came into my hands about a year ago are some specimens in all probability at least congeneric with others which have been described from the East under Cryptodesmus. These Oriental Pterodesmidæ have the dorsal tuberculation somewhat more pronounced than the African, and the radiating areas are less evident; the antennæ are somewhat more slender, and the copulatory legs are constructed on a slightly different plan. The pores are located at about the middle of the carinæ, farther back than is usual in the African forms.

Genus POCODESMUS, *nov.*

The type is *P. greeni* (Poc.),* which seems generically distinct from Ophrydesmus in the hairy body, the short, thick antennæ, the trituberculate preanal scale. The small size and apparently narrow carinæ also indicate a distinct form. Whether the other Ceylon species is congeneric can hardly be inferred from Mr. Pocock's description. In neither species is the location of the pores stated.

Genus OPHRYDESMUS, *nov.*

The antennæ have the fifth and sixth joints greatly swollen on the outer side as they lie bent; the secondary sexual characters consist in having the male legs finely hairy on the ventral surface, the sterna very deeply impressed both longitudinally and transversely, with the resulting four prominences very finely and distinctly granular and pilose with short hairs; on the sixth segment these sternal

* Journ. Bombay Nat. Hist. Soc., 1892, p. 24.

prominences are pointed; the third joint of the third legs is enormously enlarged, and bears on its ventral face a large excavation surrounded by a fringe of hairs*.

Genus CRYPTODESMOIDES Pocock, 1895.

Ann. Mus. Civ. Genova (2) XIV, p. 790.

In a Burman species called *Cr. feæ* Mr. Pocock has discovered pores located in the posterior half of the carinæ, but distant from the corner. The plate does not agree with the description which says, "well removed from and about equidistant from the lateral and posterior borders." According to the figure they are close to the lateral edge. Following the description we may suppose that the location is not so very distant from that in *Ophrydesmus*, but the genera are doubtless distinct by other characters. The *Cryptodesmi* of *Weber's Reise* may probably be referred to *Ophrydesmus*. There appears to be another disagreement between the figures and the description†; according to the last the dorsal granules become less pronounced laterad, which is true of nearly all related forms, but according to the figures there is a median granular area, with the carinæ nearly smooth.

Family OTODESMIDÆ, nov.

Under this head are to be accommodated *Trichopeltis* Poc. and *Otodesmus*, a new genus founded on *Trichopeltis watsoni* Poc. The pores are located at the base of very broad, decurved carinæ, near the anterior margin. *Otodesmus* differs from *Trichopeltis* in the shape

* OPHRYDESMUS GEDE, *sp. n.*, is the type; the carinæ are horizontal, the color is uniform dark brown above, with pale legs and yellowish antennæ; length 20 mm., width 5 mm.; locality the volcano Gede, Western Java. Beside *O. gede*, I have the following species:

O. SCAURUS, *sp. n.* Dorsum more convex and more decidedly granular, the carinæ narrower and somewhat more pointed than in the first species; color lighter brown, the carinæ yellowish; antennæ yellowish, more slender than in *O. gede*. Length 15 mm., width 3.5 mm.; locality as for *O. gede*.

O. TENGGER, *sp. n.* Differing from *O. gede* apparently mostly in size; longitudinal impression of the sterna broader and not so deep, and the four divisions not so prominent; length 13 mm., with 3.5 mm.; Tengger, East Java, 1200 feet.

O. PUGNUS, *sp. n.* Smaller and more slender than any of the above. In the pronounced granulation, somewhat narrower carinæ and more convex dorsum resembling *O. scaurus* rather than the other species; length 10 mm., width 2.2 mm.; Pengalengang.

The copulatory legs afford other diagnostic characters, but they are so complicated that it seems idle to attempt to describe them without the aid of drawings.

† Pocock, *Myriapoda* of *Weber's Reise* III, pp. 374-376, Pl. XXII, figs. 13-15.

of the posterior marginal lobes, in the dorsal sculpture, and in the copulatory legs, which are in *Trichopeltis* said to be so large and so deeply inserted that the legs of the sixth and seventh segments are widely separated to accommodate them. *Otodesmus watsoni* is from upper Burma, while *Trichopeltis bicolor* is from Sumatra, and has the anterior and and poriferous (?) carinæ dark, the others yellowish.

Family STIODESMIDÆ, *nov.*

Returning to the African and West Indian Cryptodesmoidæ, we find genera which suggest certain members of the Hercodesmidæ, but differ distinctly in that the last segment is not reduced and concealed in the nineteenth. Such are *Stiodesmus* Ck., from Liberia, and *Cynedesmus* Ck., from Grand Canary. In the last genus it seems to be possible to include *Cryptodesmus ornamentatus* Ksh., from Cuba. A specimen from Florida is more slender than *Cynedesmus*, and the pores occur only on segments 5, 7, 9, 10, 12, 13 and 15. This has been given the name *Psochodesmus crescentis* *.

The Javan genera *Pronodesmus* and *Myxodesmus* may also be placed here, although in habit they bear a very striking resemblance to such Hercodesmidæ as *Udodesmus* and its allies. *Lophodesmus* Poc. doubtless also belongs in the Stiodesmidæ; at least it seems to resemble *Stiodesmus* and *Cynedesmus* more than do *Pronodesmus* and *Myxodesmus*.

Family COMODESMIDÆ Cook, 1896.

American Naturalist XXX, p. 415.

In this case the relationship to *Cryptodesmus* is doubtful, but the location of the pores in the anterior part of the segments is at least a suggestion of such affinity, and the structure of the copulatory legs is somewhat similar to that of the Pterodesmidæ. From a cave in Jamaica I have specimens of a genus related to *Comodesmus*.

Genus INODESMUS, *nov.*

Differing from *Comodesmus* in the somewhat more slender, moniliform body, obsolete carinæ, more projecting last segment, and normal pore-formula, the pores located in shallow depressions in the lateral middle of the segments, not in front of the middle as in *Comodesmus*. The only known species, *I. jamaicensis*, is about equal in size to *Comodesmus lanatus*, and is lighter brown in color, but may be faded.

* *PSOCHODESMUS CRESCENTIS*, *sp. n.* First segment with horizontal rim very narrow; dorsal granules less pronounced than in *Cynedesmus*; carinæ narrower; color light brown; length 4.5 mm., width .6 mm.; locality Crescent City, Florida. Collected by Mr. H. G. Hubbard, of the U. S. Department of Agriculture.

Family THELYDESMIDÆ, *nov.*

The genus *Thelydesmus* Ck., while perhaps not unrelated both to *Pterodesmus* and to *Comodesmus* is so widely different that the assumption of affinity inside family lines seems unwarranted. The hispid and densely granular segments, and the comparatively narrow, tapering and dentate carinæ, render it distinct from the *Pterodesmidæ*, while the development of carinæ, the location of the pores, and the structure of the copulatory legs, separate it from the *Comodesmidæ*; indeed it is not impossible that the discovery of other related forms may connect it with the true *Cryptodesmidæ*, rather than with the other families now known from Africa.

Family DALODESMIDÆ, *nov.*

No representatives of any of the above families are as yet known from East Africa, but a new genus from Central Madagascar is in the Berlin Museum. In general appearance it bears very little resemblance to any of the families previously enumerated, and suggests rather *Rhachidomorpha* or *Rhacodesmus*. A suspicion that this new form might be related to *Thelydesmus* was destroyed by the fact that the fifth and sixth antennal joints are wider than long in *Thelydesmus*, while in *Dalodesmus* (*nov.*) the antennæ are decidedly slender and scarcely incrassate, so that the fifth and sixth joints are much longer than wide; vertex not granular; first segment not concealing and scarcely wider than the head; second segment distinctly, though not greatly, wider than the first; dorsal surface of segments minutely and regularly punctulate, appearing nearly smooth, covered with rather large and distinct rounded or subconic tubercles, those of the carinæ and margins smaller and sharper; carinæ in width scarcely equal to half the body cylinder, inserted nearly on a plane with the middle of the dorsum, subhorizontal; anterior corner wanting, posterior corner acute, somewhat elevated; pores large, located near the lateral margin, somewhat in front of the corner of the carina, facing laterad and dorsad; legs rather long, especially the last joint; sterna with a distinct cruciform impression; copulatory legs very long, slender, and straight, extending farther ahead than the insertion of the sixth pair; apex with numerous spiniform processes. The typical and only known species is *Dalodesmus tectus*. It is uniform dark brown in color, and measures about 21 mm. by 2.8 mm.

Family HYNIDESMIDÆ, *nov.*

Body minute and slender, clothed above with long, fine hairs. Dorsum very convex, the carinæ inserted far down, and decurved so as to reach below the level of the ventral surface. Antennæ short, subgeniculate and strongly clavate. The genus *Hynidesmus* (*nov.*) has

the first segment semi-elliptic, pointed and unilobate at the ends, scarcely concealing the head in front, as wide as the head or the other segments; second segment with the carinæ much enlarged, subfalcate, pointed below, not concealing the head or first segment; segments dorsally very finely roughened, but with no tubercles or granules, the hairs numerous and long, but not dense. Carinæ at the posterior corner apparently composed of two lobes, the first of which projects very slightly backward; the outer does not project caudad, but is extended cephalad (!) into a strong, pointed, somewhat depressed process which, when the animal is coiled, fits into a socket in the deficient posterior corner of the preceding segment. Pores located on the outer lobe of the carinæ, at the sinus between it and the basal lobe; pore formula 5, 7, 9, 10, 12, 13, 15-18. Last segment normal, rounded, without carinæ or tubercles, the apex narrow, somewhat projecting and decurved. Legs short and slender, inserted rather close together. The type is *Hynidesmus lanifer*, *sp. n.*, pale brownish in color, nearly 5 mm. long and .75 mm. wide, with 19 segments. It was collected at Gœncœng Filoe, West Java, at an altitude of 8,000 ft. At first I supposed this might have affinity with the another minute, hairy, Javan form described as *Helodesmus*, but the characters mentioned seem to be the only points of resemblance. A relationship of *Hynidesmus* with *Doratodesmus* seems more probable, notwithstanding the great differences in form and size. An immature specimen from Tengger, East Java, (2,000 ft.) is apparently congeneric with the above; it has 17 segments and measures 3 mm. by .4 mm.

Family DORATODESMIDÆ Cook, 1896.

Brandtia, p. 7.

The typical and first described species came from Java. Three specimens now before me seem to belong to two species, both apparently distinct, at least in size and color, from *D. armatus* Poc. Both species* have the supplementary margin regularly pectinate.

* *DORATODESMUS MURALIS*, *sp. n.* Carinæ and segments covered with large flat areas which are light colored, while the space between them is dark; dorsal processes yellowish, nearly smooth; anterior subsegments light grayish, except a v-shaped black spot in the middle of the dorsum; carinæ composed of three lobes; length about 12 mm., width 2.6 mm.; two specimens from Western Java, at an altitude of 4,000 ft.

DORATODESMUS VESTITUS *sp. n.* The areas which cover the segments are large, prominent, and with a conic tubercle in the middle: posterior segments with three transverse rows of tubercles, while only two rows appear in *D. muralis*; dorsal processes also tuberculate in the same manner as the segments; the whole animal is covered with a dense bloom which becomes light yellow as the specimen dries; in alcohol the color is uniform light brownish; length about 14 mm., width 3 mm.; Gede, Western Java, 9,000 ft.

Family CYRTODESMIDÆ Cook, 1896.

Brandtia. p. 7.

Types of *Cyrtodesmus velutinus* and *C. granosus* are in the British Museum. The latter species differs from the former in having the second segment much larger, the surface not velvety nor hairy at all, but beset with coarse granules; anal valves entirely plane. It is proposed to separate this from *Cyrtodesmus* under the name *Oncodesmus granosus* (Gerv.) *Cyrtodesmus asper* Ptrs. in the Berlin Museum appears to be more nearly related to *C. velutinus*.

Family ONISCODESMIDÆ Saussure, 1860.

The type of *Oniscodesmus* is also in the British Museum. It bears a very evident relationship to the *Pterodesmidæ*. *Oniscodesmus rubriceps* Ptrs., in the Berlin Museum, differs in being more convex, and in having the pores borne on distinct and prominent tubercles. It appears to be the type of a new genus and may take the name *Lignydesmus rubriceps* (Ptrs.). For *Oniscodesmus aurantiacus* Ptrs. the name *Detodesmus* is proposed. It differs from both *Oniscodesmus* and *Lignydesmus* in the narrow areolate border of the segments; from *Lignydesmus* it is further distinct in wanting a poriferous tubercle, and from *Oniscodesmus* in the broad sinus of the nineteenth segment and the larger last segment. *Detodesmus aurantiacus* is light-colored and has the surface of the segments smooth and clean, while in the other genera they are covered with a black, soot-like powder.

Family CYCLODESMIDÆ Silvestri, 1895.

Ann. Mus. Civ. Genova (2) XIV, p. 747.

As recently pointed out, this family if used as proposed by Sig. Silvestri is a synonym of the preceding. However, it does not appear that the relationship of *Cyclodesmus* with *Oniscodesmus* is at all close, and it is probably better to retain both families.

From a "small damp cave, Mandeville, Jamaica," come several specimens considerably more robust than *C. porcellanus* Poc., and without the notch in the posterior margin of the segments. These it is proposed to name *C. hubbardii*, for Mr. H. G. Hubbard of the U. S. Dept. of Agriculture, who collected this and other interesting species of *Diplopoda* in Jamaica and Florida. The largest specimen of *Cyclodesmus hubbardii* measures nearly 10 mm. by 2 mm. The surface of the segments is smooth and shining, but does not become white even when dried. On comparing the specimens with the types of *porcellanus* it appeared that the exoskeleton was more fragile, possibly owing to the subterranean habits of this species.

JUNE 10, 1896.

VI.

AN ENUMERATION OF THE PAUROPODA.

An opportunity of comparing European and American species of Eurypauropus has directed attention to the fact that the structural diversities of the various members of this class have not received proper systematic recognition. The analogy of the Diplopoda shows that important and long-standing divergencies may exist with slight change in the antennæ and mouth-parts, and that the structure of the exoskeleton is subject to little variation. This general stability is correlated with the similarity in the habits of all Progoneata, with the result that structural differences are of much greater morphologic and systematic importance than would be inferred while adherence is given solely to Hexapod analogies. In accordance with this view it is proposed to recognize among the Pauropoda three orders represented by Pauropus, Eurypauropus and Brachypauropus, and named respectively Cinona, Lepona, and Monona. The Cinona and Lepona have seven dorsal plates, four of which are double and cover two pediferous segments each, while in the Monona each pair of legs has a dorsal plate to correspond. It may be objected that strict priority would compel the use of the name Pauropoda instead of Cinona, in which case Bollman's name Monopoda, though hardly appropriate, might be used for the class, but this change would probably not meet with general acceptance.

The genera of Pauropoda are not numerous, and the described representatives of the three orders are not so divergent as to require more than one family in each. The Pauropodidæ contain two genera, Pauropus and Stylopauropus*; the Eurypauropodidæ four, Eurypauropus, Trachypauropus, Cyphopauropus† and Acopauropus‡; the Brachypauropodidæ are as yet monotypic, known only from Latzel's *Brachypauropus hamiger*.

That the Pauropoda are worthy of the class rank given them by Pocock can scarcely be doubted. The antennæ alone would go far toward such a determination when we consider the stability of form

* A new genus based on *Stylopauropus atomus*, *sp. n.*, and probably also including *St. pedunculatus* (Lubbock).

† Established for *Trachypauropus margaritaceus* Tœmœsvary on account of the characters noted in the appended list of species.

‡ Based on *Eurypauropus ornatus* Latzel, of which I have studied specimens belonging to the Berlin Museum.

presented by the antennæ of Diplopoda. Even *Polyxenus* has typical diplopod antennæ, and those of the related genera *Lophoproctus* and *Saroxenus** are still more closely similar to the normal type. As a class the Pauropoda are one of three coordinates under the branch or subphylum Progoneata, the others being the Diplopoda and Symphyla, perhaps more nearly related to each other than either is to the Pauropoda. It seems strange that the evident and striking diplopod homologies of the Symphyla have been so long ignored. The sclerites of the head, for instance, are exactly those indicated by a comparative study of the sutures which appear in the various diplopod orders, while the anal stylets which have seemed so remarkably thysanuran, may easily be the homologues of those of the diplopod orders Monocheta and Cœlocheta, which are again homologous to the anal bristles of the Merocheta.

The coordinates of the Progoneata are the Opisthogoneata, containing the Hexapoda and Chilopoda. The contradictory opinions drawn from the morphologic researches of recent years give increasing strength to the suspicion that homologies outside of these lines cannot be safely maintained, and that a common origin of the Opisthogoneata and Progoneata with the Arachnida, Crustacea and Malacopoda is as remote as the annelid series, so that arthropodous connecting links may never have existed. It will accordingly be necessary to subdivide the group Arthropoda, with the result that if a relationship of the Progoneata with the Opisthogoneata be allowed, there will be at least three phyla or subkingdoms. The first and perhaps the most primitive is the Malacopoda, to contain the Peripatidæ. The second consists of the Progoneata and Opisthogoneata, for which complex the name Labrata is proposed. The third phylum Branchiata will probably not long suffice for the diverse forms which it is as yet supposed to contain, though the adoption of varied and parasitic habits in the Crustacea and Arachnida weakens the force of analogy in estimating the value of structural and developmental differences.

THE SPECIES OF PAUROPODA.

1. *PAUROPUS HUXLEYI* Lubbock. Reported from various parts of Europe, England, Austria, Russia and Italy; also from Massachusetts (Kenyon), and Pennsylvania (Ryder).
2. *PAUROPUS LUBBOCKII* Packard. This is thought by Kenyon to be the same as the preceding; but no adequate description has been published.
3. *PAUROPUS IMPAR*, *sp. n.* Distinct in that the external flagellum of the stout branch of the antenna is not half as long as the other; the globulus is entirely sessile; the last pair of tactile hairs are not as strongly

* A new genus soon to be published in the *American Naturalist*. It is based on *S. scandens*, a large Liberian species with long antennæ and four large tufts of bristles to each segment.

developed as in the next species. The anal segment bears at apex above two rounded, apparently chitinous prominences; below it has a slightly tridentate structure to which are articulated two fusiform processes differing greatly from the figures of those of *huxleyi* as given by Lubbock and Kenyon; length 1.3 mm., width about .3 mm. Five specimens of this species were collected between Huntington and Cold Spring, Long Island, in May 1893.

4. *PAUROPUS BOLLMANI*, *sp. n.* Specimens in the National Museum collected by Bollman, and doubtless the same as those reported by him from Bloomington have the dorsal hairs, especially the anterior, much more strongly clavate than those of the other species, or than the figures of Lubbock and Kenyon. There seems to be but one rounded and flattened superior knob on the anal segment, and the inferior processes are more slender and closer together than in *P. impar*, though the condition of the specimens is not such as to give confidence in this observation. The rami of the stout branch are about equal in length; larger specimens are about 1 mm. long. All are of a distinctly brownish tinge, but may have become stained from the rubber corks.
5. *PAUROPUS FILIFORMIS*, *sp. n.* Described from Austria by Latzel as *P. huxleyi* var. *filiformis*. According to Latzel the differences are constant, and as they are numerous and definable the reason for the varietal designation is not clear.
6. *STYLOPAUROPUS ATOMUS*, *sp. n.* Differing from *St. pedunculatus* at least in the much smaller size, as mature individuals of both sexes are only .55 mm. long. The flagella of the antennæ have a distinct, smooth, and somewhat enlarged base as in the species of *Pauropus*, while in *pedunculatus*, according to the diagrams of Lubbock and Kenyon (copy?) the flagella are ringed nearly or quite to the base. The stout branch is nearly as long as the other, broader distad, and has the corner cut away and the appendages attached as in the figures of *pedunculatus*. Three mature specimens were found on rotting bark under fallen leaves in dry woods near Huntington in the present month.
7. *STYLOPAUROPUS PEDUNCULATUS* (Lubbock). Reported from England, Austria (Latzel), Germany (Haase), and Russia (Schmidt), but it is doubtful whether the continental species is the same as the English.
8. *EURYPAUROPUS SPINOSUS* Ryder. Known from Fairmount Park, Philadelphia (Ryder), and from Bloomington, Indiana (Bollman). I have examined Bollman's specimens and cannot object to his determination, though certainty can hardly be reached without comparison with the types of *spinosus* or with material from the typical locality. I have found what seems to be *spinosus* in considerable quantity under bark of rotting poplar branches at Kirkville, Onondaga County, New York, on three occasions. The specimens differ from those from Indiana in being somewhat lighter colored and in having the dorsal hooks slightly less numerous. A large proportion of specimens taken in September were young, while in May no young were seen.
9. *EURYPAUROPUS LATZELI*, *sp. n.* Without having seen American specimens of this genus Latzel has reported *E. spinosus* from Austro-Hungary. A careful study of Latzel's description arouses the suspicion that his species is distinct, the following being the more important discrepancies: *E. latzeli* lives solitary under stones, has the segments strongly

- convex, all the sensory hairs jointed or feathered, and the legs projecting somewhat beyond the margins of the segments. American specimens are gregarious and have always been found on or under rotting limbs; they are not strongly convex like Glomeridæ; the fourth and fifth pairs of sensory hairs are smooth, and the legs never project beyond the margins of the segments. Nearly all the other characters mentioned by Latzel might from their nature be supposed to be generic.
10. *EURYPAUROPUS CYCLIGER* Latzel. Known only from Austro-Hungary. Latzel's description seems to indicate that the dorsal hooks are not present, and that there are many sensory hairs to each segment, which would point to generic distinctness from *spinosus*.
 11. *EURYPAUROPUS POCILLIFER* Silvestri. Known only from Italy. The dorsal spines are said to be in rows, which makes the generic designation somewhat doubtful, but whether the rows are longitudinal or horizontal is not stated. The dorsal tubercles are said to be "*in medio excavatis*," but the meaning of this is not clear. The structures in question when viewed from above appear hollow in *E. spinosus*; how they differ in *E. pocillifer* is not explained.
 12. *TRACHYPAUROPUS GLOMERIOIDES* Tœmæsvary. This has been reduced by Daday to a synonym of *Eurypauropus cycliger* Ltz., but if the characters noticed under that species are really present at least the genus will probably be maintained.
 13. *CYPHOPAUROPUS MARGARITACEUS* (Tœmæsvary). According to the description this species differs from the others in the following generic characters: Body elongate, three times as long as broad; dorsum densely punctate and tuberculate, the margins with rough tubercles and a row of setæ; first segment triangular; fifth segment (only?) sinuate at the sides; seventh segment sinuate at apex, near the anus with three long hairs; legs 6-7 jointed, the tarsus 2-3 articulate, with a single claw. Known only from eastern Hungary, and said to have the habit of a small species of Glomeris.
 14. *ACOPAUROPUS ORNATUS* (Latzel). Specimens collected by Latzel were among Haase's collection acquired by the Berlin Museum (No. 1645). They are generically distinct from *Eurypauropus spinosus* in that the dorsum is longitudinally carinate, the carinæ bordered by regular rows of fine tubercles and surmounted by a row of flattened hooks which appear only on the carinæ and lateral margins, where they are expanded into large, obovate, leaf-like, reticulate appendages; sixth and seventh segments not concealed, the sixth dorsally unicarinate, the seventh produced into a narrow apical process truncate at the end; margins of segments not notched; sensory hairs of fourth segment not clavate. The dorsal parts are here much less strongly chitinized than in *Eurypauropus*, and the habit is so different as to suggest the idea that were a larger series of forms known this genus would have been placed in a subfamily or family distinct from the *Eurypauropodidæ*.
 15. *BRACHYPAUROPUS HAMIGER* Latzel. This most interesting creature measures .4 mm. by .2 mm, and is the smallest of the Progoneata; it has a transverse row of four hamules on each segment, and two such rows on the first. Latzel found it but once, and its structure was so delicate that drawings were not attempted.

JUNE 24, 1896.

VII.

THE GENERA OF ORYIDÆ.

This family is divisible into two subfamilies, the Oryini, having the spiraculiferous scutellum coalesced with its prescutellum, and the Orphnæini, in which there is a distinct prescutellum usually larger than the somewhat triangular spiracle-bearing sclerite. In the Oryini the part in question is large and rectangular, as long as the tergites and conspicuous to the naked eye on account of the large size of the forms which compose this subfamily. The Oryini comprise two closely related genera, *Orya*, from the western part of the Mediterranean basin, and *Parorya**, a new genus from Texas which may be distinguished from all American members of the suborder by the characters mentioned. Moreover it is the most robust of American Geophiloidea. From *Orya* it differs in the much slighter development of the presclerites throughout the body, which is shown most strikingly in the anal (apodous) segment where the presternite is rudimentary in the female, while very distinct in *Orya*; the spiracle-bearing scutella are also not as prominent in their anterior part as in *Orya*, where on anterior segments, especially, the lower corner in front is produced so that the spiracle appears to be located in a deep notch. The spiracles of *Parorya* are much longer and narrower than in the European genus. Both genera have the mouth-parts, anal legs and pleuræ much the same, though more secondary sexual characters may appear when males of *Parorya* are examined; the only feature of this kind to be noted at present is that in *Parorya* the apical joint of the genital palpi of the female, though small, is quite distinct, while in *Orya* it is reduced to a mere rudiment.

The genera of Orphnæini are more numerous and somewhat more varied among themselves; all are more slender and less depressed than the Oryini. No satisfactory examination of the mouth-parts and ventral pores has been made, but these are much alike in all the forms dissected, as should be the case in members of the same family. Diagnoses of these genera have been arranged as follows:

Pairs of legs 161 or thereabouts; spiraculiferous scutellum much smaller than its prescutellum; two rows of long suprascutella, the lower broad, the upper narrow; claw of maxillary palpus not pectinate; frontal lamina not dis-

* Based on *P. valida*, a new species with 113 segments, 120 mm. long when contracted in alcohol, and nearly 6 mm. broad; its locality is not definitely known, but it is probably from Texas, as it was among a collection made by Shufelt in Louisiana and Texas.

tinged; anal legs 6-jointed, long and slender, at least in the female; ventral pores on anterior segments in two transverse areas, a long posterior and a short anterior: Genus *Henioria nov.*, type *H. longissima, sp. n.*, Brazil.

Pairs of legs 111 or less, and with a different combination of the other characters mentioned.

One row of two distinct suprascutella to each segment; pairs of legs 67-85; anal legs 6-jointed, straight, divaricate, slightly crassate in males: Genus *Orphnæus* Mnt., type *O. phosphoreus* (Linn.), cosmopolitan in the tropics.

Two or three rows of suprascutella; pairs of legs 93-111.

Spiraculiferous scutellum much smaller than its prescutellum; the two separated from the main tergite by three narrow scutella whose prescutella are very small; anal legs slender, 6-jointed; frontal suture obsolete; claw of maxillary palpus with a fringe of strong pigmented spines; pairs of legs 111: Genus *Ctenoria, nov.*, type *Ct. jombene, sp. n.*, Jombene Range, East Africa.

Spiraculiferous scutellum larger or scarcely smaller than its prescutellum; anal legs 5-jointed, or if 6-jointed they are crassate and the frontal lamina is distinct, and the suprascutella are four, rather large, arranged in two rows; pairs of legs 93-105.

Anal legs 6-jointed, incrassate; spiracles large, linear or semilunar; claw of maxillary palpus rather large, pectinate; sternites with a median longitudinal sulcus, the ventral pores arranged in four distinct, sub transverse areas: Genus *Aspidopleres* (Prt.), type *A. intercalatus* (Prt.), Damaraland.

Anal legs 5-jointed.

Frontal lamina coalesced; tergites foveolate; claw of maxillary palpus excavate, not pectinate; Genus *Notiphilides* Ltz., type *N. maximiliani* (H. & S.), Mexico.

Frontal lamina distinct; tergites quadriculate; claw of maxillary palpus pectinate: Genus *Pentoria, nov.*, type *P. afra, sp. n.*, (*Orphnæus* [*Aspidopleres*] *fusatus* Prt., non Koch,) Kamerun.

The validity of the last subdivision must remain somewhat in doubt until the types can be subjected to more extensive study, as Latzel attempted only a generic sketch, and Porat thought to identify his animal with a previously described species. This last was reduced by Meinert to a synonym of *Orya barbarica*, and Porat offers no reasons for setting aside this decision except that the description and plates would fit the Kamerun species if modified in two very important particulars.

This is apparently an example of the reprehensible practice of referring new species to old descriptions whose only applicability consists in the fact that they seldom touch upon characters of present utility in generic or specific definition.

JULY 21, 1896.

Hence earlier than
July 21, 1896 minus 2 years
= earlier than July 21, 1894.
Hence typ. material must have been
collected no later than that date
(see p. 59)

VIII.

GEOPHILOIDEA FROM LIBERIA AND TOGO.

This group of Chilopoda is represented in Liberia by a few species which were named, described and figured over two years ago, but publication is still delayed, so that preliminary descriptions are offered here.

The Liberian fauna is remarkable in that it seems to contain no species of the genus *Geophilus*, representatives of which have been described from all parts of the world, though many such reports are probably based on insufficient examinations. Thus in a recent paper on the Myriapoda of Kamerun Porat has described seven new species under *Geophilus*, of which few, if any, are true *Geophili*, and some of which differ from *Geophilus* by family characters. Of the several families and genera of Geophiloidea* those thus far collected in Liberia may be distinguished from each other by the following synopsis:

Labial sternum divided; prehensorial sternum very narrow, without chitinous lines; anal pleuræ inflated, with numerous pores; sterna with a median y-shaped chitinous thickening: Family Dicellyphilidæ. The genus *Lamnonyx* Ck. has the frontal lamina incompletely chitinized in front of the labrum, the margin of the labrum entire, and a claw-like callosity at the anterior corner of the cephalic lamina below.

Labial sternum entire; prehensorial sternum broad or with chitinous lines; anal pleuræ with few pores or eporose; sterna without median chitinous thickenings.

Mandibles with a single pectinate and no dentate lamella; labrum tripartite; claw of maxillary palpus simple: Family Geophilidæ. The only Liberian genus is *Schizotænia* Ck. which is distinct from *Geophilus* in the divided maxillary sternum, the distinct prosternal teeth and prominent claw of the prehensorial legs, the want of ventral pores and the compound or spinose claw of the anal legs.

Mandibles with several lamellæ, or at least with both pectinate and dentate; labrum entire; claw of maxillary palpus pectinately fringed.

Ventral pores distributed in 2-4 indefinite areas located on the anterior and posterior parts of the sterna so that a central space is poreless; a small sclerite above the spiraculiferous scutellum: Family Oryidæ. The species which I have identified as *Orphnæus phosphoreus* (Linn.) is probably not indigenous in

* An Arrangement of the Geophilidæ, Proc. U. S. Nat. Mus. XVIII, pp. 63-75, 1893, where the Liberian genera and their typical species were indicated; their diagnosis are given in the appended list of West African species.

So they date from 1896, not 1895

recte
1896, April 23.

Liberia as it is never found except in European houses in wood perforated by termites which are probably the food of this now cosmopolitan species.

Ventral pores in a single median area; no suprascutella.

Ventral pores in a prominent, transversely oblong, chitinous plate located near the posterior margin of the sternum; maxillary sternum divided; antennæ geniculate and clavate; labrum slightly chitinized, edentate in the middle; segments rugose and scabrous dorsally: Family Ballophilidæ. The genus *Ballophilus* has the cephalic lamina and prehensorial sternum very broad, and the anal legs strongly crassate in both sexes, more especially in the males.

Ventral pores in a depressed, circular, central area, with the reticulated integument continued between the pores; antennæ filiform; labrum well chitinized, strongly dentate medianly; segments smooth: Family Schendylidæ. The Liberian genus *Ctenophilus* differs from *Schendyla* in the free labrum, three dentate lamellæ, and slender legs; from *Pectiniunguis* in the distinct labial and maxillary sterna, the slender anal legs, and the free labrum; from *Escaryus* in the presence of ventral pores, in the broad last sternum, in the two poriferous cavities of the anal pleuræ and the deficient claw of the anal legs; and from *Nannophilus* in the free labrum and the six-jointed slender anal legs.

Of these new genera *Ballophilus* is the most remarkable. The unusually large and clavate antennæ and anal legs seem to be correlated with a peculiar habit of throwing first one end of the body and then the other when disturbed, instead of crawling like other Chilopoda, this strange method of progression being swift and effective. *Ballophilus* is further protected by the unique color, often nearly black, and always inconspicuous in the twilight of the deep forests to which it seems to be confined; at least I have never found it in coffee plantations or other open places, nor does it seem inclined to burrow in the ground, where *Ctenophilus* is commonly found. In two cases I have found a female *Ctenophilus* in a small cavity in buried rotten wood, coiled up with numerous young.

A LIST OF WEST AFRICAN GEOPHILOIDEA.

The Berlin Museum contains about 20 specimens of West African Geophiloidea, all from the Togo Colony. These are very interesting in connection with the Liberian fauna. Some new species have been recognized, but they are so closely related to the Liberian that there can be no doubt that they fall within strict generic lines. The Kamerun species reported by Porat are also introduced into this list, and a part of them are evidently congeneric with the Liberian. Thus while anything like careful collecting has been done at only three points along the enormous coast line, it appears certain that as in other parts of the world the Geophilidæ, while not so widely distributed as some larger Chilopoda, are much more extended than the Diplopoda.

Family ORYIDÆ.

1. ORPHNÆUS PHOSPHOREUS (Linnæus). According to Pocock there is but one species of Orphnæus in spite of the several synonyms, and I am inclined to this view after having examined material from the Malaysia, Aldabra Islands, Liberia, and Brazil. There is some variation in coloring, but this is not constant, and depends somewhat on methods of preservation. Dried specimens frequently become purple, as was the case with the type of Linnæus. In Liberia it appears that Orphnæus lives only in civilized houses, and has doubtless been imported. It is moreover found only in the dry wood which has been riddled by termites, which probably form the chief food of this species, and would accordingly be readily carried in shipping, which explains the remarkable phenomenon related by Linnæus. At Sierra Leone a specimen appeared quite as mysteriously upon the deck of our steamer. Moreover, the other characters given by Linnæus do apply to many dried specimens, and if there is but one species of Orphnæus it may with considerable safety be called *O. phosphoreus*.
2. PENTORYA AFRA Cook. In the preceding paper were given reasons for doubt of Porat's determination of *Himantarium fusatum* C. L. Koch from Kamerun, and the above new name was given rather than to continue a false reference in the literature.

Family BALLOPHILIDÆ

- ~~1896, April 23~~ 1896, April 23 DCS Nm p. 71
3. BALLOPHILUS CLAVICORNIS Cook. Color in life fuliginous, or violaceous, or black, sometimes fading to yellowish in alcohol. Antennæ with last joint equaling the two preceding; basal lamina about three times as broad as long; mandibles with one dentate and one (or two?) pectinate lamellæ, each many-toothed; sterna bisulcate, roughened and hirsute; pleuræ of last segment moderately enlarged and pilose, the two large pores concealed under the hirsute last sternum which is broader than long (8:5); anal legs densely hirsute; pairs of legs 63-73. This species is very rare, and after much careful searching I succeeded in bringing home only about a dozen specimens. In the Berlin Museum are several examples from Togo of a form somewhat more slender and lighter colored than *B. clavicornis*, but I have found no characters sufficient to distinguish it specifically.
 4. BALLOPHILUS MACULOSUS (Porat). There can be little doubt that Porat's *Geophilus maculosus* belongs in the present genus, and the presence of *B. clavicornis* at Togo suggests that the two species may be the same, but in that case Porat has overlooked the very large pleural pores. Besides, none of the Liberian or Togo specimens has more than 73 segments, while *B. maculosus* is credited with 77.

Family SCHENDYLIDÆ.

- n.g. n.sp.
5. CTENOPHILUS AFRICANUS Cook. Bright pink in life, pale yellowish brown in alcohol, the head darker. Prehensors slightly surpassing the frontal margin of the head; sternum longer than the coxa (3:2), narrowly emarginate anteriorly; coxa with a rudimentary subapical tooth; ventral

pores nearly in the middle of the sterna; pleuræ of last segment moderately enlarged, pilose, with the two large poriferous cavities partially concealed under the last sternum, which is hairy and about twice as long as broad; pairs of legs 49-55; length 25-42 mm., width 1.5-2.5 mm. The most common geophiloid in Liberian forests. A single specimen from Togo with 55 legs lacks the last pair and is in poor condition; it may belong to this species.

6. CTENOPHILUS PAUODUS, *sp. n.* Labrum with about 15 teeth (both Liberian species have about 30); claw of maxillary palpus very large, the fringe of spines very long; prosternal teeth distinct, very broad; coxæ of prehensors without teeth; the distal interior corner rounded; ventral pores beginning on the second segment and extending about to the middle segments; last sternum broad, the posterior margin notched in the middle; two pairs of large pleural pores entirely concealed; anal legs at apex with two slender spines as in *Ct. africanus*. Two specimens from Bismarckburg, Togo, collected by Buettner are in the Berlin Museum, a male with 43 legs and a female with 45; length of former about 14 mm.
7. CTENOPHILUS EDENTULUS (Porat); from Kamerun, evidently belongs in the present genus; it has 51 pairs of legs.
8. CTENOPHILUS SIMPLEX *sp. n.* Differs from *Ct. africanus* in having a single process from the basal joint of the labial palpus, in the narrower and longer teeth of the median part of the labrum, the somewhat longer cephalic lamina and prehensors. Males of *Ct. africanus* have 49-53 legs, while a male of *simplex* has 63 legs, a female 65. This species appears to be extremely rare, only two specimens appearing in my collection, while toward a hundred of *africanus* were found.

n.s. n.sp.

Family GEOPHILIDÆ.

9. SCHIZOTÆNIA PROGNATHA Cook. Body whitish, the head brown. Antennæ with last joint exceeding the two preceding taken together; cephalic lamina longer than broad (11:8), somewhat broader anteriorly than posteriorly; basal lamina more than twice as broad as long (3:7), largely concealed by the cephalic and first scutum; prehensors much surpassing the frontal margin, their sternum of nearly equal length and width, nearly twice as long as the coxa; coxa obtusely bidentate; pleuræ of last segment somewhat enlarged, with a few large and small pores concealed under the ultimate sternum which is broader than long (5:4); anal legs with a few very long hairs, the claw with several hairs or spines; pairs of legs 41-43; length 9 mm.; width .5 mm.; rare in Liberia. A specimen in the Berlin Museum lacks antennæ and anal legs, but from the remnant of its characters seems referable to this species. It has 43 legs.
10. SCHIZOTÆNIA QUADRISULCATA (Porat) from Kamerun has 45 legs and is 10 mm. long. It differs from *S. prognatha* at least in the possession of anal pores and in the unarmed anal legs.
11. SCHIZOTÆNIA UNGUICULATA (Porat); Kamerun. Prehensorial sternum anteriorly bidenticulate, the coxa with a large fuscous tooth; pleural pores 4-6, concealed; anal pores wanting; anal legs long, 6-jointed, the basal joints with short and long setæ, the distal with a few long bristles; pairs of legs 49.

12. SCHIZOTÆNIA SUPPAR, *sp. n.* Closely allied to the last and perhaps identical with it, The prehensorial sternum has two very distinct teeth; the coxa has a distinct rounded prominence on the anterior margin somewhat above the middle, in addition to the strong distal dark brown tooth; pleural pores 8-10, concealed. There are two specimens (one minus the head) in the Berlin Museum; a male from Misahœhe, collected by Baumann, "*aus dem Moder des Urwaldes*"; a female from Bismarckburg has 51 legs, the last pair are more slender than in the male, nor are the basal joints setose. Both specimens are nearly white.
13. SCHIZOTÆNIA VARA, *sp. n.* Another near relative of the two preceding species, but apparently distinct in the very slight development of the large, tooth of the coxa of the prehensors; the tooth of the claw is also much less pointed than in *S. suppar*. The prosternal teeth are even more distinct than in that species; the pleural pores are only 3-4; the anal legs are very long and slender and nearly naked in both sexes; and there are distinct anal pores, which are absent in the other species. Several specimens from rotting leaves and humus in the forests are more slender than *S. suppar*, and rather deep brown in color; they reach 28 mm. in length and have 53-57 pairs of legs.
14. SCHIZOTÆNIA ÆQUALIS (Porat); Kamerun. Differs from the last at least in the absence of claws from the anal legs and the lack of anal pores; legs 53 pairs.
15. SCHIZOTÆNIA POROSA (Porat); Kamerun. The last pleuræ have 4-6 concealed pores and others scattered over the surface, even on the sides and dorsal surface; anal pores present; anal legs long and slender, unarmed; pairs of legs 61-69, length 37 mm.
16. TRETECHTHUS ULIGINOSUS (Porat). After a careful consideration of the characters detailed by Porat it appears that his *Geophilus uliginosus* belongs to none of the genera known from Tropical Africa, and that it is not a *Geophilus*, hence the suggestion of the present new generic name.

Family DICELLOPHILIDÆ.

17. LAMNONYX LEONENSIS Cook. Body attenuate caudad, waxy yellow, the head dark brown. Prehensors exceeding the frontal margin; sterna broader than long (6:5), longer than the coxæ (3:2), slightly emarginate anteriorly, and with an acute tooth on each side of the emargination; coxa with two teeth; the two following joints and claw each with a similar truncate tooth; legs hairy, the first pair about half as long as the second; anal pleuræ with scattering pores of different sizes; pairs of legs 49; length 20-35 mm.; width 1-2 mm. This species was abundant at Sierra Leone, and a few specimens were taken in a garden at Monrovia, where it is probably not indigenous, as I never found it in or near the forests.
18. LAMNONYX TOGENSIS, *sp. n.* Nearly related to *L. leonensis*, but strikingly different in the want of pleural pores, the absence of which is correlated with a slighter development of the pleuræ and the proportionately greater size of the last sternum, which is more than half as long as the pleuræ. This absence of pores is a remarkable character in the present genus, and I have accordingly searched for them with special care.

The specimen is mounted in balsam and has been examined under a high power, with the result that no apertures, tubes or glands can be made out, all of which parts are very easy of demonstration in similarly treated specimens of *L. leonensis*. Possibly as a compensation the anal pores and their glands are several times the size of those of *L. leonensis*. The length of body and number of legs are the same as in that species; while the armature of the prehensors and mouth-parts offer comparatively unimportant differences. A single female in the Berlin Museum, from Bismarckburg, collected by Buettner.

19. LAMNONYX GUINEENSIS (Karsch), from the Island of *Sao Thome*, is said to have 51-57 pairs of legs.
20. LAMNONYX PUNCTIFRONS (Newport) is reported from Kamerun by Porat, and a specimen from Togo is perhaps referable to this widely distributed species,

JULY 21, 1896.

IX.

A SPINNING DIPLOPOD.

It has long been known that females of *Polydesmus* and *Iulus* lay their eggs in large clusters and protect them with walls of earth and vegetable matter, probably hardened by some secretion of the animal. There have also been numerous reports of the fact that for protection during moulting somewhat similar structures are provided. The latter, at least, are probably constructed of matter which has passed through the digestive canal, while the material of the former seems from the observations of Vom Rath not to have been thus elaborated. That observer is, however, certainly in error in supposing that the moulting-nests are not of definite and constant shape in the same genus or family. Our smaller North American *Polydesmidae* construct flattened or lenticular nests with thin, almost papery, walls, while *Oxydesmi* observed in Liberia have large ovoid chambers enclosed by thick clay walls. As in both cases the external and internal appearance of the nests is characteristic and constant, and as the wall is complete and apparently of the same structure throughout, we are obliged to infer either that the material for finally closing the entrance is supplied in the manner suggested, or that the animals provide themselves in advance with enough extra clay or vegetable debris to finish their cell. It is certain also that the matter voided after the creature has taken up residence in its chamber is added to the walls, so that it becomes antecedently probable that the whole structure is built in the same manner.

With regard to the *Coelocheta* (*Lysiopetaloidea* and *Chordeumatoida*) a different condition is known to exist. Fanzago has reported for *Lysiopetalum*, and Waga and Latzel for *Craspedosoma*, the existence of nests composed of webs, but of the character of either the nests or the webs no account is current in the literature of the subject, so that it was not without surprise that recently I found on top of Lookout Mountain, Tennessee, what appear to be young specimens of *Cleidogona* (*Cryptotrichus* Packard) in loose, white, silky cocoons built on moist decaying leaves. The cocoons were so transparent that the form and color of the inclosed animal was not entirely obscured; indeed I opened the first one to see what sort of larva looked so much like a young *Cleidogona*! The occupant of the second cocoon soon became restive when his establishment was exposed to

light and air, and made his escape by gnawing a small round hole in the side of his nest, or rather by pushing aside the threads of the loose network. The whole structure is about 5 mm. across, while the animal it contained is about 9 mm. long by 1 mm. broad and has 26 segments. The threads of the network are of very even and constant diameter, slightly more than a thousandth of a millimetre. They are transparent and glassy in structure, and appear to be glued together where they lie one upon another. The open meshes are usually many times the diameter of the thread. The fabric is about equally loose throughout, the side which lies against the leaf not differing from the other parts.

That these cocoons were spun by their tenants does not admit of doubt, but the method of their production is not yet known. The *Cœlocheta* and *Monocheta* (*Stemmatoiulus*) differ from all other *Diplopoda* in the possession of large papillæ articulated to the apex of the last segment, and Vom Rath has found that these are connected with a complex internal apparatus. That these papillæ are spinning-organs has naturally suggested itself, but how the spinning is accomplished is still a mystery. The papillæ in question are each tipped with a slender fine-pointed hair. This is hollow at base, but I have been unable to follow the lumen to the apex. The supposed spinning organs of *Scolopendrella* are also tipped with a hair, but the source of the thread seems not to have been ascertained.

That the *Cœlocheta* and *Monocheta* possess functional spinning-organs which are wanting in the other orders would demand recognition in a natural arrangement of the group. This has already been accorded by their ordinal separation from the polydesmoid and iuloid forms, from which they differ by complexes of other characters.

JULY 25, 1896.

X.

AN AMERICAN GLOMEROID.

Up to the present time no member of the order Oniscomorpha has been reported from any part of the Western Hemisphere. It was accordingly a pleasant surprise to collect recently at Auburn, Alabama, numerous specimens of what appeared at first sight to be a small pill-bug, but which closer examination and dissection showed to be a new form evidently related to the European family Glomerididæ, but differing in characters which indicate long divergence from the same ancestors. The body is smaller and less heavily armored than in true Glomeridæ, though the general shape of the sclerites is much the same.

The last three pairs of legs of males are modified in nearly the same manner as in the Glomerididæ and Gervaisiidae, showing that in the Oniscomorpha as in each of the other Diplopod orders, the copulatory legs are of more or less completely independent structure and origin, and may, indeed, have been the ground of ordinal differentiation. That the differentiation of copulatory legs was begun before the power to coil into a sphere was perfected is evidenced by the fact that *Zephronia*, *Glomeris*, *Gervaisia*, and *Onomeris* (*nov.*) each use a somewhat different method. Thus a coiled *Glomeris* has a groove in the edge of the posterior corner of the first segment into which the corners of the second and third segments are fitted, and the middle of the last segment rests against the first, which is thus partially exposed. In *Onomeris* there is no groove at the posterior corner of the first segment, but a notch somewhat above connects with a curved groove or excavation not present in *Glomeris*, below and in front of which is a broad, striated margin which fits under the projecting corners of the other segments when the creature is coiled. *Onomeris* is able to coil somewhat more effectively than *Glomeris*, and the first segment is completely concealed.

In *Zephronia* the antennæ are located at the sides of the head and are accommodated under the projecting lobes of the second segment, while in *Glomeris* and *Onomeris* they are inserted near the middle of the face; they are closer together in *Onomeris*, and strongly geniculate, the sixth joint being folded against the third; they lie in two deep excavations which extend from near the median line to the single vertical row of eyes. This is in strong distinction to *Glomeris* where the vertex is not hollowed out to accommodate the antennæ, which project beyond the sides of the head into the space covered by the second segment.

The gnathochilarium of *Onomeris* is similar to that of specimens of *Glomeris conspersa*, which do not, however, resemble Latzel's diagram very closely.

The seventeenth pair of legs of males have the coxæ much enlarged, but the other joints, three in number, are reduced to mere rudiments. The eighteenth pair of legs is five-jointed, with the coxæ coalesced. The copulatory legs are, as stated, not greatly different in general shape from the European forms, but they are provided with large finely corrugated processes from the posterior face of the two last joints, in addition to processes from the median face similar to those of *Glomeris*. The last segment is broadly emarginate posteriorly; in size it is about equal proportionally to that of *Glomeris*. The surface of the segments is smooth and shining, but is finely punctate under sufficient magnification. The first segment has two transverse striations and the anterior part of the second five or six; the anterior edge of the other segments is finely margined and transversely grooved; the groove is finely and regularly crenulate like the suture of certain *Polydesmoidea*.

In color the specimens are light grayish or horn-brown, darker along the posterior margin and laterad, though the posterior and lateral edges may be pale; on some specimens there is a distinct lateral pale spot. The deficient pigmentation is no doubt correlated with the slighter chitinization of the American genus, though the small size is also to be considered. The largest specimens of *Onomeris* measure less than 5 mm. by about 2 mm. When disturbed they coil at once into a ball and do not move for two or three minutes. Over a hundred specimens of both sexes were found among rotting leaves and pine needles, near Auburn, Alabama, during the present month. The species is to be called *O. underwoodii* for my friend Professor L. M. Underwood, whom I was visiting when *Onomeris* and other interesting Myriapoda were collected.

To give this new genus a proper assignment in the classification is not easy. Evidences of affinity with *Glomeris* are evident and numerous, but many of the common characters are also shared with all the members of this peculiar order, and as noted above, the differences, while perhaps not of great importance, are such as would indicate long separation from the European stock. A Javan *Glomeroid* in my collection is evidently much nearer to the European than is the American form, although the Malayan species are apparently distinct from the European by generic differences, so that I have for some time been intending to designate *Glomeris infuscata* Poc.* as the type

* Pocock, Myriapoda of Weber's Reise, p. 324, Pl. XIX, figs. 10-10 b. *Apionomeris infuscata* comes from Sumatra.

of a new genus to be called *Apiomeris*. Even the European *Glomerididae* have never been subjected to a careful comparative study of structural characters, and many species have been described with little more than colors to distinguish them. A comparison of the European material at my disposal makes it appear probable that the recognition of a separate family for *Onomeris* will be found warranted and desirable, and there appears to be in the literature no account of any form which could serve as a connecting link between *Glomeris* and the American genus. The chief objection to this position now apparent is that consistency may compel the elevation of Latzel's *Glomeris minima* (= *Latzelia* Bollman, preoccupied, = *Glomeridella* Brœlemann) to an equally exalted position. However, the great similarity in form of the eighteenth pair of male legs in forms so widely separated as *Glomeris*, *Onomeris* and *Gervaisia*, is good reason for supposing that it is a primitive character, and that the remarkable forcipate eighteenth legs of *Glomeridella* are indicative of equal or greater divergence. It is moreover similarly suggestive that the very numerous species of *Glomeris*, have, as far as known, copulatory legs and their accessory pairs built on the same general plan, the differences being so slight that European writers have seldom taken the pains to point them out, a task which would doubtless give some interesting results in the line of constant minor differences.

KEY TO THE FAMILIES OF GLOMEROIDEA.

Tergites eleven, strongly roughened, their posterior margins prominently elevated and tuberculate; mentum entire: Family *Gervaisiidae*.

Tergites twelve, smooth and even; mentum divided.

Eighteenth legs of male four-jointed, stout, forcipate; nineteenth pair not exceeding the eighteenth, three-jointed; their median lamina large and flabellate; eleventh tergite much reduced: Family *Glomeridellidae*, *nov.*

Eighteenth legs five-jointed, slender, not forcipate, exceeded by the very robust nineteenth pair; median lamina small and rectangular or lingulate; eleventh tergite normal.

Seventeenth legs of male with coxa enlarged, otherwise atrophied to a three-jointed rudiment; second segment with a broad, striated anterior and lateral margin separated by a distinct transverse groove; antennæ accommodated in deep excavations in the vertex, which leave a narrow ridge around the margins and a prominent median crest: Family *Onomerididae*, *nov.*

Seventeenth legs of male of the normal form, and only slightly reduced; second segment smooth except for a marginal notch or groove at the inferior posterior corner; antennæ not included in fossæ, their terminal joints extending beyond the sides of the head: Family *Glomerididae*.

JULY 29, 1896.

XI.

THE LARVÆ OF STEMMATOIULUS.

In February of the present year I collected some peculiar diplopod larvæ on an island in the St. John's River, Grand Bassa County, Liberia. This island, though not in a swampy region, is covered with pandanus and other low-land trees, and is no doubt flooded in the rainy season. The larvæ were about 30 in number, and pure white in color, except a single reddish ocellus. The largest individuals measure nearly 5 mm. in length by about .8 mm. ; some are as much as one-third smaller. They were guarded by a large female of *Stemmatoiulus bellus*, which was coiled about them in a manner strongly suggesting that of *Scolopendra* or *Geophilus*. They were not enclosed in any nest or egg-case, but were lying on moist sand under a rotting log. That they were newly hatched is made certain by the fact that they had not yet begun to crawl about, and that some are still included in a membrane covering the entire animal without distinction of parts, apparently the same motionless, pupiform condition in which the young of *Iulidæ* leave the egg, but which is not known in *Polydesmidæ* and *Glomerididæ*. On escaping from this membrane the larvæ of *Stemmatoiulus* have five-jointed antennæ and three pairs of six-jointed legs, but they differ from all known six-legged diplopod larvæ in the possession of thirty-five segments. The six-legged larvæ of *Polyxenus* have five segments, while those of the *Glomeroidæ*, *Polydesmidæ*, and *Iulidæ* have seven. The mother of these larvæ had 49 segments, and numerous adult specimens of the same species vary only between 48 and 50.

In connection with the other remarkable and probably primitive characters of *Stemmatoiulus* this peculiarity of the larvæ is very suggestive. The possession of this great number of segments increases the size of the embryos and limits their number ; other *Diplopoda* lay about three times as many eggs. We may hence infer that this is another of the primitive features of *Stemmatoiulus*, and that the many-segmented embryo and larva are ancestral conditions from which a majority of the *Diplopoda* have advanced. In the light of this fact the hitherto unique embryonic feature of the epimorphous *Chilopoda*, the possession of the full adult complement of segments and legs, has great importance, as confirming the view that the *Progoneata* and *Opisthogoneata* may be remotely descended from a many-

segmented ancestor, and that this apparently anomalous character of the Epimorpha is after all, merely a primitive condition which most Labrata have left. Moreover, it no longer throws doubt upon the affinity of the Epimorpha with the other Chilopoda, or of these with the Hexapoda.

That a many-segmented embryo was the condition which obtained among the remote ancestors of the Labrata may, then, be inferred from three considerations :

1. A many-segmented condition not being an advantage would not be called into existence or favored by natural selection.
2. This condition appears in two unrelated orders of Labrata whose nearer relatives are distinctly anamorphous.
3. It also appears in the viviparous Malacopoda which are probably more nearly related to the ancestors of the Labrata than any other extant forms.

The hexapodous condition of the young of Diplopoda furnishes accordingly very slight argument for any direct or genetic relationship between the Diplopoda and the Hexapoda, as Bollman declared, even without the support of the present evidence.

That the embryos and larvæ of the ancestors of *Stemmatoiulus* were at one time provided with numerous legs as well as segments is indicated by the existence of a nearly complete series of chitinized, flattened, lanceolate processes or propodia, more highly developed than the so-called "buds" which precede the legs of some other Diplopoda, and doubtless homologous with the ventral appendages of Campodea and other apterous hexapods. We have here additional reason to believe what has long been suspected, that these abdominal appendages are rudimentary legs. Moreover, the protrusible vesicles of *Machilis* and even the collophore of the *Collembola* may easily be remnants of the likewise protrusible nephridial structures which appear on the coxæ of all the legs of *Colobognatha*, and on some of those of *Cœlocheta*, but have otherwise disappeared from the Diplopoda. At any rate, these various problematical appendages in Campodea, Japyx, and *Machilis*, if ancestral, rudimentary and transformed from their original function, do not furnish reasons for supposing their possessors to have any close affinities, nor break the force of the wonderful structural diversity long known to exist between the various Thysanuran families. Lubbock pointed out over twenty years ago that the association of Campodea and Japyx with the Thysanura proper (*Lepisma*, *Machilis*) must be considered as merely provisional, and subsequent discoveries have rendered their distinctness more and more apparent. The proposition of Grassi and Stummer-Traunfels to place Japyx and Campodea with the *Collembola* as a suborder En-

tognatha does not give a more natural arrangement, which will hardly be reached until four orders of so-called Apterygogenea are recognized *. The recent refusal of certain eminent entomologists to take this step because the groups are nearly monotypic, is, to say the least, unscientific, but not less so than the willingness to recognize as natural groups assemblages of apparently unrelated forms. Thus it has long been known that Machilis and Lepisma have more in common with the Orthoptera than with Japyx, Campodea, and the Collembola, but each new work attempts the task of describing together the indistinguishably diverse, with a variety of minor changes which go far toward rendering classification chaos.

The Cœlocheta are probably the nearest relatives of the Monocheta, and it is a suggestive fact that among them no six-legged larvæ have been discovered, the youngest yet reported having 15 segments and the same number of legs, in a species referred by Latzel to *Attractosoma*. In *Lysiopetalum* forms with less than 30 segments are not yet known. It is also remarkable that the prolegs of the larva of *Stemmatoiulus* are all of the same form and size, so that it appears not unlikely that at the first moult nearly the full complement of legs for the thirty-five segments would have been added.

In these young larvæ of *Stemmatoiulus* the exoskeleton is still membranous and shrivels up on drying; there appears to be no trace of the peculiar ornamentation of the surface, and the pleural sutures are indistinguishable. A peculiar feature is the presence on the ventral parts of each side of the tergites of four long bristles, of which the inferior is longest; no other bristles can be made out, and it is probably these same bristles which appear in the adult in a rudimentary condition. The expansion of the ventral part of the body necessary when the legs are added would bring the bristles more nearly into the subdorsal position which they occupy in the adult. The great size of these structures in the young larvæ is another character tending to show their primitive nature and probable homology with the enormous spines of geologic forms. The bristles of young *Stemmatoiuli* are, however, simple, slender, and smooth, in strong distinction to the barbed, clavate hair-structures of young *Merocheta*; they are equal in length to nearly one-third of the diameter of the segments to which they are attached, and are directed obliquely backward, so that when a coiled larva is viewed from the side it appears to be supplied throughout with slender legs.

The Colobognatha are another order presenting many primitive characters. No six-legged larvæ are known. The youngest

* Haliday's duplicate generic name for Japyx, *Dicellura*, would furnish an appropriate ordinal designation, while the name *Rhabdura* is proposed for an order to contain Campodea.

specimens of *Polyzonium germanicum* reported by Latzel had 14 or 15 segments and 12-16 pairs of legs. At Sierra Leone in December 1893 and January 1894 I collected numerous specimens of Siphonotidæ (*Rhinotus africanus* Ck.), a family even more primitive than the Polyzoniidæ. The smallest of these has 15 segments and 21 pairs of legs, that is, it has only two terminal apodous segments, as in adults. This is further evidence of the proposition that Diplopoda originally had numerous segments and legs, even in the larval condition, for Iulidæ and other forms in which the pleuræ have disappeared always have several apodous segments when immature, a series of segments being added at each moult, while the legs for them are not supplied until the next

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XII.

NEW AMERICAN PLATYRRHACIDÆ.

The genus *Platyrrhacus* was based by C. L. Koch on a Brazilian species, *Polydesmus scaber* Perty, or at least on a specimen so determined, and described as being slightly convex, densely granulate, and with a row of distinct, pearl-like tubercles along the posterior margin of each segment. There are said to be two other rows of somewhat smaller tubercles placed wider apart. Although the carinæ are said to be strongly toothed, they appear from the plate that the teeth are broad and rounded. After studying the description in connection with that of another American species described by Koch, *Platyrrhacus rufipes*, the opinion has been gained that it would not be safe to identify it, even generically, with any of the material which has come into my hands for study.

The genera *Stenonia* and *Stosatea* Gray, having had no types assigned to them by their author, remained *nomina nuda* and can be neglected, as Gray himself did in the preparation of a list of the Myriapoda of the British Museum (1844), a paper overlooked or misplaced in the bibliographies of Latzel, Daday and Silvestri. If we accept for *Stenonia* a type proposed by a later writer* it must be *Polydesmus dentatus* (Olivier), a species not known to Gray, a result certainly not in the interest of either justice or clearness. In the past no rule has been consistently followed, the name *Stenonia* having been applied to a great number and variety of genera, both American and Malayan. When sufficient types and new material have been studied, it will be necessary to rehabilitate the genus *Platyrrhacus*, which may supplant one of those proposed below, but *Stenonia* should be allowed to rest in oblivion.

The number of American genera of *Platyrrhacidae* is doubtless very considerable, representatives of several of which have been loaned me by various museums. The impossibility of describing all these under one name, and the apparent artificiality of any arrangement which does not take into account a wide complex of the characters of a series of related forms, are my excuse for proposing the new genera whose diagnoses are arranged in the following table :

Dorsum strongly convex, the carinæ strongly decurved in the direction of the dorsal arch; carinæ of segment 19 distinctly pointed; last segment broadly

*Gervais, *Apteres* IV, p. 95, 1847.

rounded; sterna with a prominent conic process at the base of each leg; dorsal surface finely and evenly granular, the granules not prominent; tubercles distinct but not conspicuous; areas indistinct; lateral margin of carinæ with several long, bead-like, smooth granules, which are somewhat pointed on posterior segments; anterior and posterior margins of carinæ finely and sharply dentate: Genus *Cyphorrhacus*, *nov.*, type *C. andinus*, *sp. n.*, Ecuador, U. S. National Museum.

Dorsum moderately convex or flat, the carinæ more or less horizontal; carinæ of segment 19 broad and rounded at the posterior corners; last segment usually broadly truncate; genera which may not be clearly eliminated by the above characters have either the sternal spines small or obsolete, the dorsum coarsely granular or finely so, and with the tubercles obsolete, the areas distinct or entirely absent, the lateral margins subentire, with coarse granules, or with large pointed teeth, the anterior margins of the carinæ smooth or beaded with rounded granules, or some combination of these characters.

Carinæ of moderate width, with a prominent, square shoulder at base in front; dorsum densely beset with distinct, prominent, rounded granules and divided into three transverse rows of polygonal areas, each of which has a distinct, though not conspicuous tubercle in the middle; tubercles of the posterior row much more conspicuous than the others; first segment with an anterior row of large tubercles, behind which is a distinct transverse depression vertex densely and finely granular, prominent and subcristate on each side of the sulcus; pores removed from the margin by five or six times the diameter of the small ring; clypeus smooth and shining below: Genus *Psammodesmus* *nov.*, type *Ps. cos*, *sp. n.*, Colombia, Philadelphia Academy.

Carinæ broad and wing-like, with the shoulder slight or wanting; dorsum with very fine, sparse or flattened granules; or if the granules are strong there is no trace of areas, and the carinæ not very wide, the first segment has no large anterior row of granules, the vertex is rounded and with rather scattering coarse granules, or the pores are close to the margin or removed from it by only two or three times the width of the large and prominent rings.

Pores situated in the posterior half of the carina, just above the lateral edge, which is entire or subgranular; dorsal surface divided into large areas suggesting those of *Polydesmus*; copulatory legs small, rather slender, the apical processes subequal in length, strongly divaricate: Genus *Nanorrhacus* *nov.*, type *N. lucie* (Poc.), Santa Lucia, West Indies, British Museum.

Pore near the middle of the carina, remote from the margin by at least two or three times the diameter of the ring; lateral edge nearly always distinctly granulate or dentate, with the posterior corner acute and distinctly produced; areas either wanting or numerous; copulatory legs with the ultimate divisions unequal, approximate or connivent.

Dorsum densely beset with equal, prominent, rounded granules; the tubercles similar, but larger, the three rows about equally distinct; areas entirely wanting; lateral margins with large, rounded, bead-like granules; first segment with no specially enlarged granules in front; copulatory legs divided immediately above the hairy portion into two slender subapproximate processes, the anterior of which is longer; both processes are strongly curved cephalad, and the larger is bent nearly into a circle: Genus *Rhyphodesmus*, *nov.*, type *Rh. terminalis*, *sp. n.*, ~~British~~ Museum.

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